

The American Midland Naturalist

Devoted to Natural History,

Primarily that of the Prairie States

**Twenty-fifth
Anniversary Number**

MAY, 1934

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Note:--Contributions on general and midland natural history will be gladly received. Papers on botany and allied subjects, zoology, geology and physical geography, should be addressed to the respective editors, whose addresses are given on the cover. Authors of papers on geology and paleontology are asked to confer with the editors before preparing copy of illustrations.

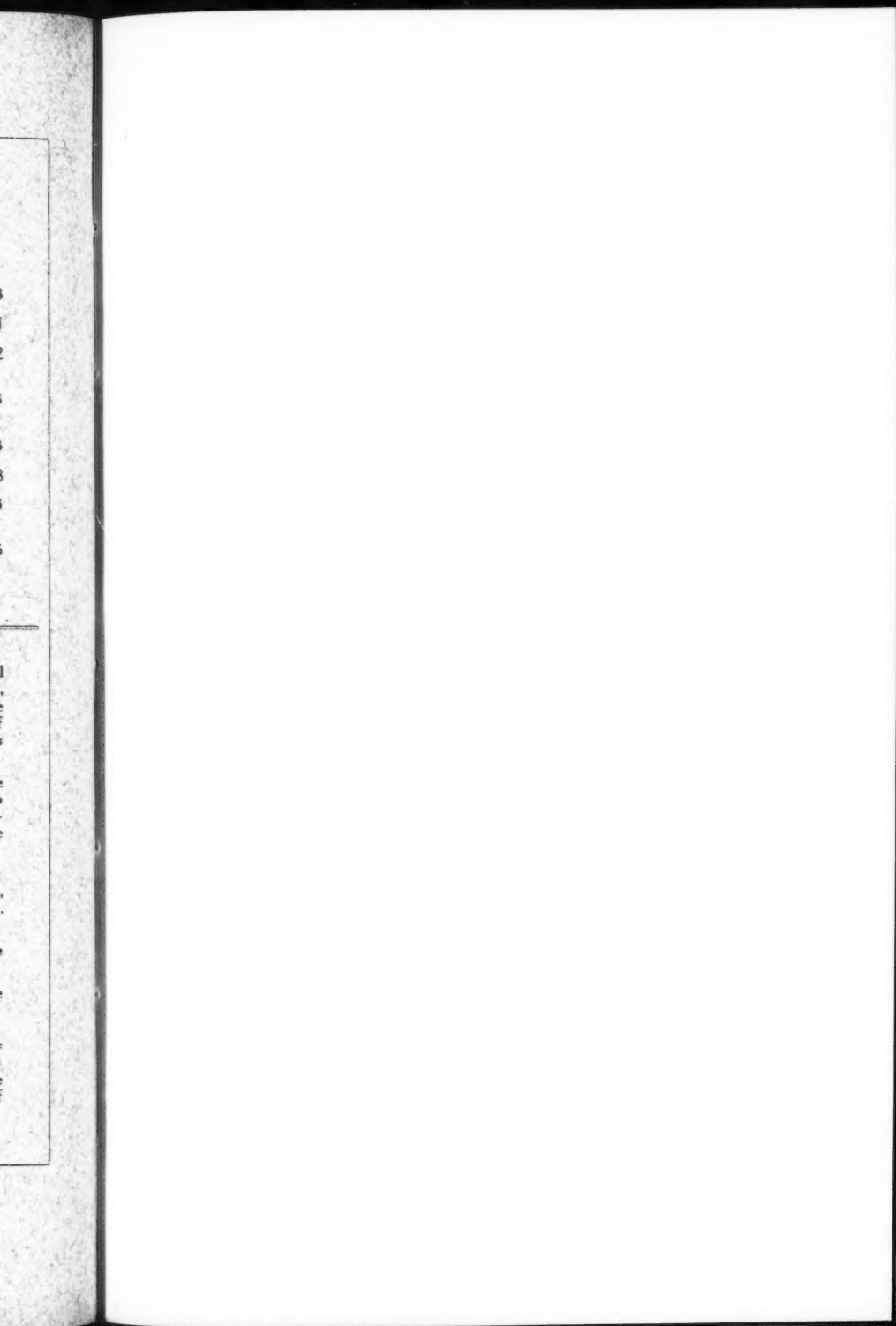
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J. M. Caudill



IN APRIL, 1909, the first number of "The Midland Naturalist" appeared. It was a new venture among the well-established scientific journals of the mid-western area. Its title was soon changed to "The American Midland Naturalist" and as such it has just completed twenty-five years of continuous existence. Its history has been eventful, yet it gained recognition in the scientific world. Today a series of fourteen volumes with approximately 6000 pages marks the completion of its pioneer period. The future will test its mission. Though primarily concerned with the Middle West and its life, the scope of the contributions realizes the broader outlook originally intended by its founder. Once established it served as a medium of expression of scientific thought for a long list of illustrious contributors, many of whom have since passed away. A new generation has joined this distinguished assemblage, and is carrying on with due reverence for the tradition which it inherited. It is in this spirit that heartiest congratulations are extended to the

REV. J. A. NIEUWLAND, C.S.C.,
Founder and Editor of
The American Midland Naturalist.



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The American Midland Naturalist

PUBLISHED BI-MONTHLY BY THE UNIVERSITY OF NOTRE DAME,
NOTRE DAME, INDIANA.

VOL. XV.

MAY, 1934

No. 3

THE FERNS AND THE FLOWERING PLANTS OF SAINT JOSEPH COUNTY, INDIANA*

SR. ELIZABETH SETON MC DONALD, S.C.

Introduction

This catalog of the ferns and the flowering plants of Saint Joseph County, Indiana, is based chiefly on the material deposited in The Nieuwland Herbarium of The University of Notre Dame. It represents a collection of plants made during a period of twenty-five years. Credit for most of the specimens and the records is due to Reverend J. A. Nieuwland whose continued labors have resulted in an herbarium of some twenty thousand specimens. In this catalog are listed 1,144 species, 24 varieties, forms and hybrids.

Lists of minor collections incorporated in the catalog are those of Mr. Charles C. Deam of the State Department of Conservation, of Reverend P. E. Hebert of the University of Notre Dame, of Dr. Marcus W. Lyon, Jr. of South Bend, of Professor E. J. Maurus of the University of Notre Dame. Some records from the Field Museum of Natural History, Chicago, and from the Edward Lee Greene Herbarium of the University of Notre Dame, also, are included. The stations cited represent practically the whole county (cf. map.).

The nomenclature and sequence of families follow largely that of The New York State Museum Bulletin No. 254, "Annotated List of the Ferns and Flowering Plants of New York State," by Homer D. House. The names proposed by Reverend J. A. Nieuwland have been adopted throughout the list.

When plants listed are found only in the Nieuwland Herbarium, no herbaria symbols are used. When records from other herbaria are cited an (ND) is used if a specimen of the particular species is found, also, in the Nieuwland Herbarium. Otherwise, only the initials of the respective herbaria in which the specimens are found are used. The following symbols are used:

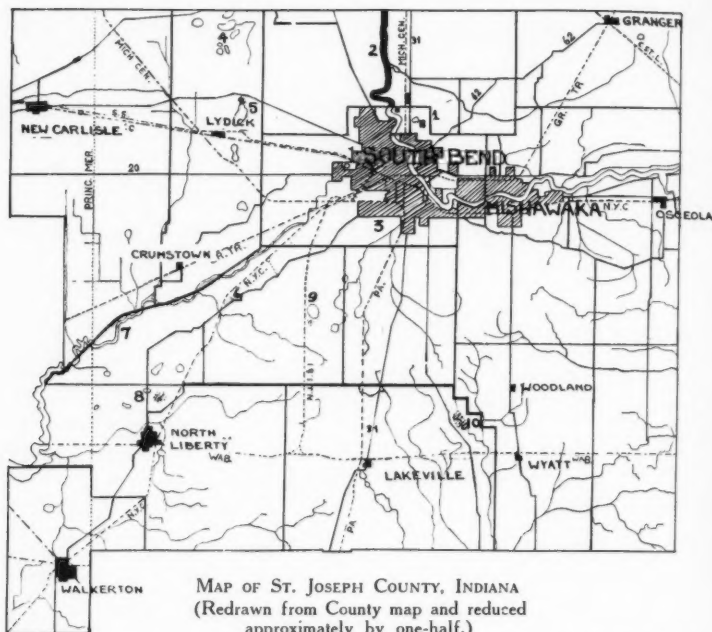
D—Charles C. Deam, Bluffton, Indiana.

G—Edward Lee Greene, U.N.D.

H—Reverend P. E. Hebert, U.N.D.

L—M. W. Lyon, Jr., South Bend, Indiana.

* Contributions to the Fauna and Flora of Indiana, No. 1.



1) Notre Dame and vicinity; I. I. R.R. west, Ravine near St. Mary's College, Ryan's woods (SE). 2) St. Joseph River north of St. Mary's College, 4-mile bridge, Healthwin, Boy Scout Reservation. Webster's Crossing north of Notre Dame. 3) Rum Village, Studebaker Woods, south of South Bend. 4) Mud Lake and others, near Michigan Boundary Line. 5) Chain Lakes and vicinity. 6) Swamp six miles southwest of South Bend. 7) Kankakee River and vicinity. 8) Sausley Lake and swamp east of it, both about 2 miles north of North Liberty. 9) Wharton Lake and Woods, south of South Bend. 10) Turkey Creek Swamp, southeast of South Bend.

ACKNOWLEDGEMENTS

Specialists have identified or verified the determinations of a number of the plants listed. To each of these due acknowledgements are made. These identifications and verifications are: practically all of the grasses, shrubs, trees, and asters, Mr. Charles C. Deam; the genus *Cyperus*, Sister Mary Joseph Geise of Notre Dame College; the genus *Amelanchier*, Dr. K. N. Wiegand of Cornell University; the genus *Cuscuta*, Professor E. T. Wherry of the University of Pennsylvania; the family *Scrophulariaceae*, Dr. F. W. Pennell of the Philadelphia Academy of Natural Science; the genera *Solidago* and *Euthamia*, Professor R. C. Friesner of Butler University.

The writer also wishes to acknowledge the kind consideration of Reverend Francis Wenninger, Dean of the College of Science, who made possible the opportunity to carry on this work; the helpful suggestions and criticisms given by Reverend J. A. Nieuwland in the preparation of this catalog; the continued interest and generous assistance of Dr. Theodore Just under whose immediate supervision the study was made.

An expression of grateful appreciation is extended to Reverend P. E. Hebert for the use of his plants and records; to Mr. Charles C. Deam and Dr. M. W. Lyon, Jr., for their records; to the officials of The University of Notre Dame for the use of The Edward Lee Greene and The Nieuwland Herbaria and Libraries; to Miss Ellen D. Kistler, Librarian.

Botrychium
Bogs
Botrychium
var. *d.*

Osmunda
Osmunda
Osmunda

Onoclea
Cystopteris
Polystichum
Mud
Thelypteris
Swamp
Thelypteris
Thelypteris
Thelypteris
ton La
Thelypteris
Lake.

Anchistea
(ND, I)
Asplenium
(ND, I)
Adiantum
(ND, I)
Pteridium

Azolla caroliniana
of St.

Equisetum
Equisetum
Equisetum
Equisetum

Lycopodium
Lycopodium
Lycopodium

Catalog of Plants

PTERIDOPHYTA

Ophioglossaceae

- Botrychium virginianum* (L.) Sw. Notre Dame. Studebaker Woods. Granger.
Bogs and woods north of Lakeville. (ND,D,H,L)
Botrychium obliquum Muhl. Webster's Crossing. (ND,H)
var. *dissectum* (Spreng.) Prantl. North of St. Mary's.

Osmundaceae

- Osmunda cinnamomea* L. Webster's Crossing. (ND,D)
Osmunda regalis L. Notre Dame. SW of South Bend. Granger. (ND,H)
Osmunda Claytoniana L. North Liberty. Lakeville. Notre Dame. (ND,H)

Polypodiaceae

- Onoclea sensibilis* L. Notre Dame.
Cystopteris fragilis (L.) Bernh. Studebaker Woods. Mud Lake. (ND,D)
Polystichum acrostichoides (Michx.) Schott. Notre Dame. Wharton Lake.
Mud Lake. (ND,D,H,L)
Thelypteris palustris Schott. Notre Dame. Chain Lakes. Turkey Creek
Swamp. (ND,D)
Thelypteris cristata (L.) Nwd. Turkey Creek Swamp. (ND,H,L)
Thelypteris spinulosa (Muell.) Nwd. Turkey Creek Swamp. (ND,D,H)
Thelypteris intermedia (Muhl.) House. Notre Dame. Turkey Creek. Whar-
ton Lake. (ND,L)
Thelypteris hexagonoptera (Michx.) Weatherby. Woods north of Wharton
Lake. (ND,D)
Anchistea virginica (L.) Presl. North Liberty Swamp. Lakeville.
(ND,D,H,L)
Asplenium platyneuron (L.) Oakes. Notre Dame. North of Wharton Lake.
(ND,L)
Adiantum pedatum L. Studebaker Woods. Chain Lakes. Wharton Lake.
(ND,D,H,L)
Pteridium latiusculum (Desv.) Maxon. Notre Dame. Chain Lakes. (ND,H)

Salviniaceae

- Azolla caroliniana* Willd. Very rare. Found only one season after a high flood
of St. Joseph River into "Ox-bow Loop."

Equisetaceae

- Equisetum arvense* L. West of St. Mary's. North of Lakeville.
Equisetum pratense Ehrh. St. Mary's.
Equisetum fluviatile L. Chain Lakes. Notre Dame. (ND,D,H)
Equisetum hyemale L. Notre Dame.

Lycopodiaceae

- Lycopodium lucidulum* Michx. Wharton Woods.
Lycopodium obscurum L. Webster's Crossing. Chain Lakes. (ND,H,L)
Lycopodium complanatum L. St. Mary's. Six-mile Swamp.

Gramineae

- Andropogon provincialis* Lam. (D)
Andropogon scoparius Michx. (D,H)
Sorghastrum nutans (L.) Nash. (D)
Syntherisma sanguinalis (L.) Dulac. Notre Dame. St. Mary's. (ND,H)
Leptoloma cognatum (Schultes) Chase. Notre Dame. (D,H)
Paspalum pubescens Muhl. Notre Dame. (ND,H)
Echinochloa crusgalli (L.) Beauv. Notre Dame.
Panicum dichotomiflorum Michx. (D,H)
Panicum capillare L. Notre Dame. (ND,D,H)
Panicum virgatum L. Notre Dame. (ND,D,H)
Panicum agrostoides Spreng. (D)
Panicum depauperatum var. *psilophyllum* Fernald. (D)
Panicum boreale Nash. Notre Dame.
Panicum perlongum Nash. Notre Dame. (D)
Panicum dichotomum L. (D,H)
Panicum implicatum Scribn. (H)
Panicum huachucae Ashe. Chain Lakes. (ND,H)
Panicum praecocius Hitchc. & Chase. St. Mary's.
Panicum villosissimum Nash. (D,H)
Panicum tsugetorum Nash. (D)
Panicum oligosanthes var. *Scribnerianum* (Nash) Fernald. Notre Dame.
 (ND,D,H)
Panicum latifolium L. Notre Dame.. (ND,D,H)
Panicum meridionale Ashe. (D)
Panicum clandestinum L. (D)
Setaria lutescens (Weigel.) Hubbard. Notre Dame.
Setaria viridis (L.) Beauv. Notre Dame. (ND,H)
Setaria italica (L.) Beauv. (D)
Cenchrus pauciflorus Benth. Notre Dame.
Zizania aquatica L. Studebaker Woods.
Leersia virginica Willd. (D)
Phalaris canariensis L. North of St. Mary's. Notre Dame, roadside.
Phalaris arundinacea L. (H)
Hierochloa odorata var. *fragrans* (Willd.) Richter. Notre Dame. Along the
 Big Four RR. (ND,H)
Milium effusum L. (D)
Oryzopsis racemosa (J. F. Smith) Ricker. Ravine, St. Mary's.
Stipa spartea Trin. (D,H)
Aristida purpurascens Poir. (D,H)
Muhlenbergia Schreberi Gmel. (D,H)
Muhlenbergia mexicana (L.) Trin. (ND,H)
Muhlenbergia foliosa (R. & S.) Trin. (D,H)
Brachyelytrum erectum (Schreb.) Beauv. Woods north of Wharton Lake.
 Ravine, St. Mary's. (ND,D,L)
Phleum pratense L. Notre Dame. (ND,D)
Alopecurus aequalis Sobol. Studebaker Woods. (ND,D,H)

- Sporobolus vaginiflorus* Torr. (ND,D,H)
Sporobolus asper (Michx.) Kunth. (H)
Sporobolus heterolepis A. Gray. Ravine, St. Mary's.
Cinna arundinacea L. Notre Dame. (ND,D)
Agrostis stolonifera var. *major* (Gaud.) Farwell. Notre Dame. (ND,D,H)
Agrostis canina L. Notre Dame.
Agrostis perennans (Walt.) Tuckerm. (D,H)
Agrostis hyemalis (Walt.) B.S.P. Along the St. Joseph River. Swamp north of North Liberty. Chain Lakes. (ND,D,H)
Calamagrostis canadensis (Michx.) Beauv. Notre Dame. Six-mile Swamp. (ND,D,H)
Calamagrostis inexpansa A. Gray. Chain Lakes. (ND,D)
Calamagrostis cinnoides (Muhl.) Barton. Notre Dame.
Deschampsia caespitosa (L.) Beauv. Six-mile Swamp. (H)
Arrhenatherum elatius (L.) Beauv. Notre Dame.
Danthonia spicata (L.) Beauv. (H)
Spartina michauxiana Hitchc. Notre Dame. Walkerton. (ND,D,H,L)
Eleusine indica (L.) Gaertn. Notre Dame. (ND,H)
Phragmites communis Trin. Near Kankakee River, Green Township. (ND,D)
Triodia flava (L.) Hitchc. (D,H)
Eragrostis Frankii Steud. Notre Dame.
Eragrostis pilosa (L.) Beauv. Notre Dame.
Eragrostis caroliniana (Spreng.) Scribn. Notre Dame.
Eragrostis cilianensis (All.) Link. Notre Dame. (ND,H)
Eragrostis spectabilis (Pursh.) Steudel. Along the I.I.R.R. (ND,D)
Eragrostis pectinacea (Michx.) Nees (ND,D,H)
Sphenopholis pallens (Spreng.) Scribn. Turkey Creek Swamp. Chain Lakes. (ND,D,H)
Koeleria cristata (L.) Pers. (ND,D)
Dactylis glomerata L. Swamp, southeast of South Bend. St. Mary's. (ND,H)
Poa debilis Torr. (D)
Poa pratensis L. (D,H)
Poa sylvestris (Torr.) A. Gray. Studebaker Woods. (ND,D,H)
Poa compressa L. (ND,H)
Poa annua L. (D,H)
Poa alsodes A. Gray. (D)
Panicularia canadensis (Michx.) Kuntze. Studebaker Woods. Chain Lakes.
Panicularia nervata (Willd.) Kuntze. Studebaker Woods. Chain Lakes. (ND,D,H)
Panicularia pallida (Torr.) Kuntze. (H)
Panicularia septentrionalis (Hitchc.) Bick. Studebaker Woods. (ND,D,H)
Festuca octoflora Walt. (D)
Festuca ovina L. Ravine, St. Mary's. (ND,H)
Festuca elatior L. Between Chain Lakes and Lydick. (ND,H)
Festuca obtusa Spreng. Four-mile bridge. (ND,D,H)
Bromus tectorum L. Notre Dame. (ND,H)
Bromus asper Murr. Notre Dame.

Bromus
Bromus
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Lolium
Agropyron
 (ND)
Agropyron
Agropyron
Hordeum
Elymus
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Hystrix
 va.

Cyperus
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 Lakes
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 (ND)
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Eleocharis
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Stenophyllum
Fimbristylis
Eriophorum
Eriophorum
Scirpus
Scirpus
Scirpus

- Bromus purgans* L. Six-mile Swamp.
Bromus inermis Leyss. Near Kankakee River.
Bromus Kalmii A. Gray. Notre Dame.
Bromus secalinus L. (D,H)
Bromus commutatus Schrad. (ND)
Bromus japonicus Thunb. Chain Lakes. Ravine, St. Mary's. Lydick. (ND,H)
Lolium perenne L. Notre Dame. Red Mill. St. Mary's.
Agropyron repens (L.) Beauv. Between Chain Lakes and Lydick. St. Mary's. (ND,H)
Agropyron caninum (L.) Beauv. (H)
Agropyron Smithii Rydb. (H)
Hordeum jubatum L. (ND,H)
Elymus virginicus L. Studebaker Woods. St. Mary's. (ND,H)
Elymus striatus Willd. Ravine, St. Mary's. (ND,D,H)
Elymus canadensis L. Ravine, St. Mary's. (ND,H)
Hystrix patula Moench. Notre Dame. (ND,D,H)
 var. *bigeloviana* Fernald. Studebaker Woods. (ND,D)

Cyperaceae

- Cyperus flavescens* L. North of Notre Dame. Studebaker Woods.
Cyperus rivularis Kunth. Sousley Lake. (ND,H)
Cyperus Nieuwlandii Geise. (*C. flavescens* L. x *C. rivularis* Kunth) Chain Lakes. Vicinity of Notre Dame.
Cyperus inflexus Muhl. Record (Umbach) from The Field Museum.
Cyperus Schweinitzii Torr. Chain Lakes. West of South Bend.
Cyperus esculentus L. St. Mary's.
Cyperus strigosus L. Notre Dame. Studebaker Woods. Chain Lakes. (ND,D,H)
Cyperus filiculmis Vahl. St. Mary's, banks of St. Joseph River.
 var. *macilentus* Fernald. (H,D)
Cyperus speciosus Vahl. Sousley Lake.
Cyperus Engelmanni Steud. Record: Indiana Species of *Cyperus*, Sr. M. Joseph Geise.
Cyperus erythrorhizos Muhl. Studebaker Woods. Notre Dame. (ND,D)
Eleocharis ovata (Roth.) R. & S. Sousley Lake. (ND,H)
Eleocharis obtusa (Willd.) Schultes. Southeast of Notre Dame. Studebaker Woods. Six-mile Swamp.
Eleocharis acicularis (L.) R. & S. Studebaker Woods. Sousley Lake. North of Wharton Lake. (ND,D,H)
Eleocharis acuminata (Muhl.) Nees. (H)
Stenophyllus capillaris (L.) Britt. (D)
Fimbristylis geminata (Nees) Kunth. (H)
Eriophorum angustifolium Roth. Six-mile Swamp. (ND,H)
Eriophorum viridicarinatum (Engelm.) Fernald. Chain Lakes. (ND,H)
Scirpus americanus Pers. Chain Lakes. (ND,H)
Scirpus validus Vahl. Chain Lakes. (ND,D,H)
Scirpus robustus Pursh. North Liberty Swamp.

- Scirpus fluviatilis* (Torr.) A. Gray. (H)
Scirpus atrovirens Muhl. Chain Lakes. Stuebaker Woods.
Scirpus lineatus Michx. Chain Lakes. Red Mill. West of Notre Dame. (ND,H)
Scirpus cyperinus (L.) Kunth. Notre Dame. Chain Lakes. Stuebaker Woods.
Scirpus pedicellatus Fernald. Stuebaker Woods. (ND,D)
Hemicarpha micrantha (Vahl.) Pax. Record (Umbach), The Field Museum. (H)
Dulichium arundinaceum (L.) Britt. Stuebaker Woods. (ND,D)
Rynchospora alba (L.) Vahl. North Liberty Bog.
Mariscus mariscoides (Muhl.) Kuntze. Chain Lakes. Six-mile Swamp.
Carex retroflexa Muhl. Chain Lakes.
Carex convoluta Mackenzie. Southeast of Notre Dame. (ND,H)
Carex Muhlenbergii Schk. Southeast of Notre Dame. (ND,H)
Carex cephalophora Muhl. Southeast of Notre Dame. (D,H)
Carex sparganioides Muhl. Southeast of Notre Dame. Stuebaker Woods. St. Mary's. Southwest of South Bend. (ND,D,H)
Carex vulpinoidea Michx. M.C.R.R., Notre Dame. (ND,D)
Carex annectans Bicknell. (D)
Carex diandra Schk. North Liberty Swamp. (ND,H)
Carex prairea Dewey. Six-mile Swamp.
Carex stipata Muhl. Notre Dame. Stuebaker Woods. Chain Lakes. Lakeville. I.I.I. Swamp. (ND,D,G,H)
Carex trisperma Dewey. North Liberty Swamp.
Carex canescens L. (D,H)
Carex bromoides Schk. Woods west of New Carlisle. (ND,D)
Carex sterilis Willd. Six-mile Swamp.
Carex Leersii Willd. Kankakee Marsh. (ND,H)
Carex scoparia Schk. Chain Lakes. Six-mile Swamp. (ND,D,H)
Carex tribuloides Wahl. Below Lakeville. (ND,D)
Carex Bebbii Olney. Notre Dame. (ND,H)
Carex normalis Mackenzie. Lakeville. (G)
Carex festucacea Schk. (D)
Carex Jamesii Schw. South Bend. (ND,D)
Carex leptalea Wahl. Six-mile Swamp. Turkey Creek Swamp. (ND,H,L)
Carex communis Bailey. Near Lakeville. (ND,D,G)
Carex pennsylvanica Lam. Notre Dame. Stuebaker Woods. (ND,G)
Carex varia Muhl. Ravine, St. Mary's. (ND,D)
Carex hirtifolia Mackenzie. Stuebaker Woods. (ND,D,G)
Carex tetanica Schk. North Liberty Swamp. (H)
Carex Meadii Dewey. Six-mile Swamp.
Carex plantaginea Lam. Stuebaker Woods. (ND,D)
Carex careyana Torr. Stuebaker Woods. Haag Woods. (ND,G,H)
Carex laxiculmis Schw. Near Lakeville. (ND,D,G)
Carex albursina Sheldon. Stuebaker Woods. (ND,D,G)
Carex blanda Dewey. Ravine, St. Mary's. Red Mill. Webster's Crossing. (ND,D)

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 Chain
Lemma
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Lemma m
 Lake.
Bruniera
 baker
Bruniera

- Carex laxiflora* Lam. Studebaker Woods. Notre Dame. (ND)
Carex granularis Muhl. (G)
Carex grisea Wahl. I.I.I. Swamp. (ND,D,H)
Carex glaucoidea Tuckerm. Notre Dame. M.C. RR.
Carex gracillima Schw. Woods, north of New Carlisle. (ND,D)
Carex Davisii Schw. & Torr. Notre Dame.
Carex Swanii (Fernald) Mackenzie. Studebaker Woods. Webster's Crossing.
 (ND,D)
Carex Buxbaumii Wahl. Six-mile Swamp. (ND,H,L)
Carex stricta Lam. Six-mile Swamp.
Carex Haydenii Dewey. Webster's Crossing.
Carex crinita Lam. St. Joseph River, St. Mary's. I.I.I. Swamp. (ND,D,H)
Carex lanuginosa Michx. Notre Dame. Webster's Crossing. (ND,H)
Carex cryptolepis Mackenzie. Six-mile Swamp. (H)
Carex flava L. Six-mile Swamp. (ND,L)
Carex folliculata L. Notre Dame. Ryan's Woods.
Carex rostrata Stokes. Notre Dame, M.C.RR. I.I.I. Swamp. (ND,H)
Carex retrorsa Schw. St. Mary's. Studebaker Woods.
Carex lurida Wahl. Studebaker Woods.
Carex comosa Boott. St. Mary's.
Carex intumescens Rudge. (D)
Carex Grayi Carey. Studebaker Woods. (ND,D,H)
Carex lupulina Muhl. Studebaker Woods. Notre Dame, M.C.RR. (ND,D,H)

Araceae

- Arisaema triphyllum* (L.) Torr. Notre Dame. Ravine, St. Mary's. Studebaker Woods. Lakeville. Granger. Kankakee Marsh. Mishawaka.
 (ND,D,H)
Arisaema deflexum Nwd. & Just. Turkey Creek Swamp. (ND,L)
Muricauda Dracontium (L.) Small. Ravine, St. Mary's. (ND,D,H)
Peltandra virginica (L.) Kunth. North Liberty. Chain Lakes. Lakeville. St. Mary's.
Spathyema foetida (L.) Raf. North of Notre Dame. Lakeville. North Liberty. Granger. (ND,H)
Acorus Calamus L. Woods, north of Wharton Lake. Sweeney's Crossing.
 (ND,L)

Lemnaceae

- Spirodela polyrhiza* (L.) Schleid. Notre Dame. Lakeville. Dollar Lake. Chain Lakes.
Lemna trisulca L. Notre Dame. Mishawaka. Lakeville. Wharton Lake. Dollar Lake. Chain Lakes. (ND,H)
Lemna minor L. Notre Dame. Mishawaka. Lakeville. Wharton Lake. Dollar Lake. Chain Lakes. (ND,H)
Bruniera punctata (Griseb.) Nwd. Back of St. Mary's. Pond near Studebaker woods.
Bruniera columbiana (Karst.) Nwd. Notre Dame. Chain Lakes. Lakeville.

Eriocaulaceae

Eriocaulon septangulare With. Notre Dame, along the St. Joseph River. (ND,D)

Commelinaceae

Commelina communis L. St. Mary's. (ND,H)

Tradescantia reflexa Raf. Notre Dame. Chain Lakes. (ND,D,H)
f. *albiflora* Slavin & Nwd. Notre Dame, east of Cartier Field.

Pontederiaceae

Pontederia cordata L. Mud Lake. (ND,L)

Heteranthera dubia (Jacq.) MacM. Notre Dame, St. Mary's Lake. (ND,H)

Juncaceae

Juncus effusus L. Notre Dame. Studebaker Woods. Chain Lakes. Deer Lake. (ND,H)

Juncus Dudleyi Wiegand. St. Mary's. Webster's Crossing. Chain Lakes. (ND,D)

Juncus dichotomus Elliott. St. Mary's. Studebaker Woods. Chain Lakes. Swamp, northeast of Walkerton. (ND,D,H)

Juncus nodosus L. St. Mary's, Ravine. Webster's Crossing. Six-mile Swamp. (ND,L)

Juncus canadensis J. Gay. (D)

Juncus acuminatus Michx. Notre Dame, St. Joseph River. Webster's Crossing. Chain Lakes.

Juncoides intermedium (Thuill.) Rydb. North of Notre Dame. Studebaker Woods (ND,D,H)

Melanthaceae

Trianthella glutinosa (Michx.) House. Chain Lakes. North Liberty Swamp. (ND,H,L)

Melanthium virginicum L. Grand Trunk RR. west of South Bend.

Liliaceae

Hemerocallis fulva L. Notre Dame. South Bend.

Allium cernuum Roth. Northwest of Notre Dame. (ND,L)

Allium vineale L. Near Chamberlain Lake.

Allium canadense L. Notre Dame, St. Joseph River. Granger. Six-mile Swamp.

Lilium umbellatum Pursh. Oliver's, west of South Bend. Meadow and along railroad, Notre Dame. Six-mile Swamp. (ND,L)

Lilium canadense L. Northwest of Notre Dame. Grand Trunk RR., west of South Bend.

Lilium superbum L. Notre Dame.

Erythronium americanum Ker. Notre Dame, St. Joseph River. Studebaker Woods. Mud Lake. (ND,H)

Erythronium albidum Nutt. Northwest of Notre Dame, along the St. Joseph River. I.I.I. RR. One mile south of Healthwin. (ND,H)

Ornithogalum umbellatum L. Notre Dame.

Muscari racemosum (L.) Miller. Northwest of St. Mary's.

Alettris farinosa L. Lakeshore RR., now extinct.

Asparagus
Vagnera
Vagnera
Unifolius
Swan
Uvularia
Polygonum
Polygonum
(ND)
f.

Medeola
Trillium
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Woods
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Trillium

Nemexia
Nemexia
Nemexia
Smilax
Smilax

Hypoxis

Dioscorea

Iris versicolor

Sisyrinchium

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Convallariaceae

- Asparagus officinalis* L. Throughout the county. (ND,H)
Vagnera racemosa (L.) Morong. Notre Dame. (ND,D,H)
Vagnera stellata (L.) Morong. Notre Dame, near the lakes. (ND,D)
Unifolium canadense (Desf.) Greene. Webster's Crossing. Turkey Creek Swamp. Bass Lake. (ND,D,H)
Uvularia grandiflora J. E. Smith. St. Mary's. (ND,H)
Polygonatum biflorum (Walt.) Ell. Notre Dame. North Liberty. (ND,D,H)
Polygonatum commutatum (R. & S.) Dietr. Southwest of Notre Dame. (ND,H,L)
f. ramosum McGivney. One mile southeast of Notre Dame. (ND,H)

Trilliaceae

- Medeola virginica* L. North Liberty. North of Wharton Lake. (ND,D,H)
Trillium sessile L. St. Mary's. North Liberty. Lakeville. (ND,D)
Trillium recurvatum Beck. Ravine, St. Mary's. (ND,D,H)
Trillium grandiflorum (Michx.) Salisb. North of Notre Dame. Studebaker Woods. (ND,D,H)
Trillium erectum L. Notre Dame. Studebaker Woods.
Trillium declinatum (A. Gray) Gleason. Studebaker Woods. (ND,H)

Smilacaceae

- Nemexia herbacea* Small. Notre Dame. (ND,H)
Nemexia pulverulenta Small. Notre Dame. (ND,D)
Nemexia ecirrhata (Engelm.) Small. Notre Dame, St. Joseph River.
Smilax rotundifolia L. Notre Dame. Lakeville. (ND,H)
Smilax hispida Muhl. Common in the County.

Amaryllidaceae

- Hypoxis hirsuta* (L.) Coville. Six-mile Swamp. (ND,L)

Dioscoreaceae

- Dioscorea paniculata* (Michx.) Bart. Notre Dame.

Iridaceae

- Iris versicolor* L. Notre Dame. Chain Lakes.
var. blandescens Nwd. I.I.I. RR., Notre Dame.
Sisyrinchium albidum Raf. North and southeast of Notre Dame. Healthwin. Six-mile Swamp. (ND,D,H,L)
Sisyrinchium angustifolium Mill. Notre Dame.
Sisyrinchium gramineum Curtis. Ravine, St. Mary's. Six-mile Swamp. (ND,H)
Sisyrinchium apiculatum Bick. Webster's Crossing. Granger.
var. mesochorum Nwd. Webster's Crossing.
Sisyrinchium mucronatum Michx. Southeast of Notre Dame. Webster's Crossing. Lydick. Chain Lakes.

Orchidaceae

- Cypripedium candidum* Willd. Grand Trunk RR., west of South Bend. Notre Dame, St. Joseph Lake. Six-mile Swamp. (ND,H,L)
Cypripedium pubescens Willd. Turkey Creek road. Crumstown.
Cypripedium reginae Walt. Turkey Creek Swamp. (ND,H,L)
Cypripedium acaule Ait. Turkey Creek near Woodland. North Liberty Swamp. (ND,L)
Galeorchis spectabilis (L.) Rydb. South of Mishawaka. Studebaker Woods.
Perularia flava (L.) Farwell. Notre Dame, I.I.I. RR. North of Wharton Lake. (ND,L)
Coeloglossum bracteatum (Willd.) Hartm. Lakeville.
Gymnadeniopsis clavellata (Michx.) Rydb. Notre Dame.
Limnorchis hyperborea (L.) Rydb. Notre Dame. Granger.
Blephariglottis leucophea (Nutt.) Farwell. Chain Lakes.
Blephariglottis psycodes (L.) Rydb. Notre Dame. I.I.I. RR.
Pogonia ophioglossoides (L.) Ker. Big Four RR., near Granger. Rare.
Cathea tuberosa (L.) MacM. Six-mile Swamp. (ND,H,L)
Ibidium plantagineum (Raf.) House. St. Mary's. Chain Lakes.
Ibidium cernuum (L.) House. Notre Dame, banks of St. Joseph Lake.
Liparis Loeselii (L.) L. C. Richard. Studebaker Woods. Chain Lakes. Bass Lake. (ND,H,L)
Aplectrum hyemale (Muhl.) Torr. Notre Dame. Studebaker Woods. (ND,H,L)
Corallorrhiza maculata Raf. Studebaker Woods. Chain Lakes. Wharton Lake. (ND,H,L)
Corallorrhiza odontorhiza (Willd.) (H)

DICOTYLEDONES

Saururaceae

- Saururus cernuus* L. Notre Dame. Webster's Crossing M.C. RR. (ND,D)

Juglandaceae

- Juglans cinerea* L. (ND,D)
Juglans nigra L. Walkerton. Along the Kankakee River. (ND,L)
Hicoria cordiformis (Wang.) Britton. Studebaker Woods.
Hicoria alba Britton. Throughout the County.
Hicoria ovata (Mill.) Britton. Notre Dame. Studebaker Woods.
Hicoria laciniata (Michx.f.) Sarg. Along the St. Joseph River.

Myricaceae

- Comptonia peregrina* (L.) Coulter. At the Michigan boundary.

Salicaceae

- Populus balsamifera* L. Crumstown.
Populus heterophylla L. Southwest of South Bend. (ND,D)
Populus grandidentata Michx. Notre Dame. (ND,D)
Populus tremuloides Michx. Notre Dame. Webster's Crossing. Chain Lakes. (ND,D,H)

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- Populus deltoides* Marsh. Notre Dame. St. Mary's. (ND,D)
Salix nigra Marsh. (D,H)
Salix amygdaloides Anders. (D)
Salix pentandra L. (H)
Salix serissima (Bailey) Fernald. (H)
Salix lucida Muhl. Notre Dame. (ND,D)
 var. *intonsa* Fernald (D)
Salix fragilis L. Notre Dame, around the lakes.
Salix interior Rowlee. Notre Dame, Seminary. Webster Crossing. (ND,D,H)
Salix glaucophylla Bebb. Webster's Crossing. (ND,H)
Salix candida Fluegge. Turkey Creek road, eight miles southwest of South Bend. Lakeville. North Liberty. Chain Lakes. (ND,H,L)
Salix bebbiana Sarg. Chain Lakes. (ND,D)
Salix sericea Marsh. (D)
Salix discolor Muhl. (D)
 var. *eriophila* Michx. (D)
Salix humilis Marsh. Southeast of Notre Dame. Webster's Crossing. Chain Lakes.
Salix pedicellaris Pursh. Chain Lakes.

Betulaceae

- Carpinus caroliniana* Walt. Stuebaker Woods. (ND,D,H)
Ostrya virginiana (Mill.) K. Koch. Notre Dame. Four-mile bridge. Stuebaker Woods. Lydick. (ND,D,H)
 var. *glandulosa* Sargent. (D)
Corylus americana Walt. Notre Dame. Stuebaker Woods. (ND,D,H)
Betula populifolia Marsh. Notre Dame.
Betula lutea Michx. Chain Lakes. Walkerton. (ND,H,L)
Betula pumila L. Webster's Crossing. Chain Lakes. Turkey Creek Swamp. (ND,H,L)
Alnus rugosa (DuRoi) Sprengel. Record: Am. Mid. Nat. 3:228

Fagaceae

- Fagus grandifolia* Ehrh. Woods north of Lakeville.
Quercus rubra L.
Quercus palustris DuRoi
Quercus velutina Lam.
Quercus imbricaria Michx. I.I.I. RR., Notre Dame. Ravine, St. Mary's. Sumption Prairie road, south of South Bend.
Quercus alba L. Notre Dame. (ND,D,H)
Quercus macrocarpa Michx. Stuebaker Woods.
Quercus bicolor Willd. Notre Dame, St. Joseph River.
Quercus Muhlenbergii Engelm. One mile east of North Liberty, Geyer Farm. (ND,D,L)

Ulmaceae

- Ulmus americana* L. Turkey Creek Swamp. (ND,D,H)
Ulmus Thomasi Sargent. Stuebaker Woods. (ND,H)

Ulmus fulva Michx. (D)

Celtis occidentalis L. St. Mary's.

Moraceae

Morus rubra L. Studebaker Woods. Notre Dame. (ND,H)

Morus alba L. Studebaker Woods. Notre Dame (escaped)

Toxylon pomiferum Raf. Notre Dame (escaped). (ND,H)

Cannabinaceae

Humulus americanus Nutt. Four-mile bridge. (ND,H)

Cannabis sativa L., North of Notre Dame. St. Mary's. Webster's Crossing.

Dry bank of Kankakee River. (ND,L)

Urticaceae

Urtica dioica L. Southeast of Notre Dame.

Urtica procera Muhl. Notre Dame.

Urtica gracilis Ait. Studebaker Woods. (ND,D)

Laportea canadensis Gaud. Studebaker Woods. (ND,D)

Adicea Nieuwlandii Lunell. Studebaker Woods.

Adicea pumila Raf. St. Mary's. (ND,D)

Ramium cylindricum (L.) Kuntze. Notre Dame. St. Mary's. Studebaker Woods. (ND,D)

Helxine pennsylvanica (Muhl.) Nwd. Notre Dame, Grotto. (ND,H)

Santalaceae

Comandra umbellata (L.) Nutt. Notre Dame, M.C. RR. Webster's Crossing.

Asaraceae

Asarum canadense L. Notre Dame. Studebaker Woods. (ND,H,L)

Asarum reflexum Bick. (D)

Aristolochia Serpentaria L. Notre Dame, Calvary. St. Mary's. Woods south-east of Notre Dame. (ND,H)

Polygonaceae

Acetosa Acetosella Mill. Notre Dame. (ND,D,H)

Rumex mexicanus Meissn. Oliver's, South Bend.

Rumex verticillatus L. St. Mary's. Studebaker Woods. Notre Dame.

Rumex altissimus Wood. Notre Dame. Crumstown.

Rumex Britannica L. St. Mary's. (ND,D,H)

Rumex crispus L. Notre Dame. (ND,D,H)

Polygonum aviculare L. Granger. (ND,D,H)

Polygonum erectum L. Studebaker Woods.

Polygonum tenue Michx. (D)

Tovara virginiana Raf. North of Lakeville. (ND,D,H)

Persicaria fluitans (Eaton) Greene. Turkey Creek road. Webster's Crossing. Oliver's, South Bend.

Persicaria coccinea (Muhl.) Greene. Studebaker Woods. Southeast of Notre Dame. (ND,D)

var. *asprella* Greene. Notre Dame. Near Lydick.

Persicaria carictorum Nwd. Stuebaker Woods.

Persicaria mesochora Greene. Notre Dame, lakes. (ND,H)

Persicaria lapathifolia (L.) S. F. Gray. Webster's Crossing. (ND,D)

Persicaria pennsylvanica (L.) Small. Notre Dame. Webster's Crossing.

Persicaria mitis (L.) Gilib. Notre Dame.

Persicaria hydropiperoides (Michx.) Small. Notre Dame. Stuebaker Woods.
Webster's Crossing.

Persicaria Hydropiper (L.) Opiz. Notre Dame.

Persicaria punctata (Ell.) Small. Notre Dame. (ND,D)

Persicaria orientalis (L.) Spach. Notre Dame.

Fagopyrum vulgare Hill. Notre Dame.

Tracaulon sagittatum (L.) Small. Notre Dame. Chain Lakes. (ND,D)

Tracaulon arifolium (L.) Raf. Turkey Creek swamp. (ND,D)

Bilderdykia Convolvulus (L.) Dumort. Notre Dame.

Bilderdykia scandens (L.) Greene. (H)

Pleuropterus Zuccarinii Small. St. Mary's.

Amaranthaceae

Amaranthus retroflexus L. Stuebaker Woods. (ND,H)

Amaranthus blitoides S. Wats. Notre Dame.

Amaranthus graecizans L. Stuebaker Woods. (ND,H)

Acnida altissima Riddell. West of St. Mary's. Notre Dame. Sousley Lake.

Chenopodiaceae

Chenopodium hybridum L. Notre Dame. St. Mary's. Southeast of Notre Dame. (ND,H)

f. *Griffithsii* Aellen. Notre Dame, (10418, Herb. Wash. U.S.)

Chenopodium album L. Notre Dame. (ND,D,H)

Chenopodium Boscianum Moq. Notre Dame. St. Mary's. Sousley Lake.

Chenopodium Botrys L. Notre Dame. St. Mary's.

Chenopodium lanceolatum Muhl. (D)

Blitum capitatum L. Notre Dame, near Science Hall.

Cycoloma atriplicifolium (Spreng.) Coult. North of Chain Lakes. Notre Dame. I.I.I. RR.

Atriplex hastata L. Notre Dame.

Salsola pestifer A. Nelson. St. Mary's. West of South Bend.

Phytolaccaceae

Phytolacca americana L. Mud Lake. (ND,D,H)

Corrigiolaceae

Anychia canadensis (L.) B.S.P. Stuebaker Woods. Notre Dame. (ND,D,H)

Scleranthus annuus L. St. Mary's. Webster's Crossing. Lost Lake.

Nyctaginaceae

Allionia nyctaginea Michx. Notre Dame, M.C. RR. Lake Shore RR. west of South Bend. (ND,H)

Aizoaceae

Mollugo verticillata L. Notre Dame. (ND,H)

Portulacaceae

Claytonia virginica L. Studebaker Woods. Notre Dame. Webster's Crossing. (ND,H)

Portulaca oleracea L. (H)

Alsineaceae

Alsine media L. Notre Dame. (ND,D,H)

Alsine longifolia (Muhl.) Britton. Notre Dame. (ND,D,H,L)

Alsine longipes (Goldie) Coville. Notre Dame.

Cerastium vulgatum var. *hirsutum* Fries. (D,H)

Cerastium longipedunculatum Muhl. Notre Dame. Webster's Crossing. Studebaker's Woods. North Liberty.

Cerastium arvense L. St. Mary's. Webster's Crossing. (ND,D,H)

Arenaria serpyllifolia L. Webster's Crossing. St. Mary's.

Arenaria stricta Michx. St. Mary's. Red Mille.

Moehringia lateriflora (L.) Fenzl. St. Mary's. (ND,D,H)

Tissa rubra (L.) Britton. Lost Lake, near New Carlisle.

Caryophyllaceae

Agrostemma Githago L. Notre Dame. Webster's Crossing.

Evactoma stellata var. *scabrella* Nwd. Notre Dame. (ND,H)

Silene latifolia (Mill.) Britten & Rendle. Notre Dame. Near Granger. Mishawaka. (ND,H)

Silene antirrhina L. Southeast of Notre Dame. Granger. (ND,H)

Silene noctiflora L. Notre Dame, I.I.I. RR. Between Chain Lakes and Lydick. (ND,H,L)

Lychnis alba Mill. Granger. Mishawaka. Notre Dame, I.I.I. RR.

Lychnis Coronaria (L.) Desr. Notre Dame. (ND,H)

Saponaria officinalis L. Notre Dame. (ND,H)

Vaccaria vulgaris Host. Oliver's, South Bend. Grand Trunk RR., South Bend.

Dianthus barbatus L. Escaped along the lakefront, Novitiate, Notre Dame. (ND,H)

Dianthus Armeria L. North of St. Mary's. (ND,H)

Cabombaceae

Brasenia Schreberi Gmel. Mud Lake. Sousley Lake. Clear Lake. (ND,L)

Nymphaeaceae

Nuphar advena R.Br. Notre Dame. Studebaker Woods. (ND,L)

Nuphar variegatum Engelm. Studebaker Woods. (Now extinct.)

Castalia odorata (Dryand.) Woodville & Wood. Studebaker Woods. (ND,H,L)

Castalia tuberosa (Paine) Greene. Notre Dame. Chain Lakes.

Magnoliaceae

Liriodendron Tulipifera L. Notre Dame. (ND,D)

Anonaceae

Asimina triloba (L.) Dunal. Notre Dame. Studebaker Woods. St. Mary's (ND,D)

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Ranunculaceae

- Hydrastis canadensis* L. St. Mary's. Red Mill. Boy Scout Reservation.
Caltha palustris L. Swamp near St. Joseph River. North of North Liberty.
 (ND,D)
Coptis groenlandica (Oed.) Fernald. Turkey Creek Swamp. (ND,H,L)
Isopyrum bitermatum (Raf.) T. & G. Notre Dame. Studebaker Woods.
 (ND,D,H)
Actaea alba (L.) Mill. Notre Dame. Studebaker Woods. (ND,D,H)
Aquilegia canadensis L. Banks of St. Joseph River. Lakeville. (ND,D,H)
Anemone virginiana L. Notre Dame. Four-mile bridge. (ND,D,H)
Anemone canadensis L. Notre Dame. Four-mile bridge. Woods, near St.
 Joseph River. (ND,D,H)
Anemone quinquefolia L. Northeast of Notre Dame. Banks of St. Joseph
 River. (ND,D,H)
Hepatica triloba Chaix. Woods, north of North Liberty. Banks of St. Joseph
 River. (ND,H)
Hepatica acutiloba DC. Studebaker Woods. (ND,D,H)
Syndesmon thalictroides (L.) Hoffmg. Red Mill. State ditch, north of
 Notre Dame. (ND,D)
Ranunculus delphinifolius Torr. Sousley Lake.
Ranunculus abortivus L. I.I.I. RR. Swamp. Notre Dame, banks of St. Joseph
 River. Mishawaka. (ND,D,H)
Ranunculus recurvatus Poir. Ravine, St. Mary's. Studebaker Woods. South-
 east of Notre Dame. I.I.I. RR. Swamp. (ND,D,H)
Ranunculus acer L. Granger. Mishawaka. Lydick. Oliver's, South Bend.
 (ND,H)
Ranunculus pennsylvanicus L. Notre Dame. Sousley Lake.
Ranunculus repens L. Swamp near St. Joseph River.
Ranunculus septentrionalis Poir. St. Mary's.
Ranunculus hispidus Michx. Webster's Crossing. Boy Scout Reservation.
 Haag Woods. Studebaker Woods. Chain Lakes. (ND,D,H)
Ranunculus fascicularis Muhl. Notre Dame. Southeast of Notre Dame. Along
 the St. Joseph River. Studebaker Hills. (ND,D,H)
Batrachium circinatum (Sibth.) Reichenb. Chain Lakes. North of Notre
 Dame. (ND,H,L)
Thalictrum revolutum DC. (H)
Thalictrum dasycarpum Fisch. & Lall. North of Notre Dame. Turkey Creek
 Road. (ND,H)
Thalictrum dioicum L. Notre Dame. St. Mary's. Lakeville. (ND,D,G,H,L)
Thalictrum canadense Mill. Turkey Creek Swamp.
Clematis virginiana L. Notre Dame.

Berberidaceae

- Berberis vulgaris* L. Studebaker Woods. Notre Dame. St. Mary's.
Berberis Thunbergii DC. River bank, St. Mary's. (Escaped) (ND,H)
Caulophyllum thalictroides (L.) Michx. Studebaker Woods. (ND,D)
Podophyllum peltatum L. Notre Dame, woods near river.

Menispermaceae

Menispermum canadense L. St. Mary's. (ND,H)

Lauraceae

Sassafras officinale Nees & Eberm. Chain Lakes. Three miles north of Lakeville. (ND,D,H)

Sassafras albidum var. *glauca* Nwd. Studebaker Woods. (Leaves unlobed.)

Benzoin aestivale (L.) Nees. Studebaker Woods. (ND,D)

Papaveraceae

Papaver Rhoeas L. Studebaker Woods. (Escaped). (ND,H)

Argemone mexicana L. Webster's Crossing.

Sanguinaria canadensis L. St. Mary's, along the river. Studebaker Woods. North Liberty. (ND,D,H)

Stylophorum diphyllum (Michx.) Nutt. Studebaker Woods. (ND,D,H)

Chelidonium majus L. Along the St. Joseph River on a high sandy bank. (ND,H)

Fumariaceae

Capnorchis canadensis (Goldie) Kuntze. Notre Dame. Studebaker Woods. (ND,H)

Capnorchis Cucullaria (L.) Planch. Studebaker Woods. North of Notre Dame. (ND,H,L)

Capnoides flavulum (Raf.) Kuntze. Studebaker Woods.

Capnoides aureum (Willd.) Kuntze. (H)

Cruciferae

Draba verna L. North of Notre Dame. (ND,H)

Draba caroliniana Walt. Notre Dame. (ND,H)

Camelina microcarpa Andr. Notre Dame. (ND,H)

Bursa pastoris Weber. Notre Dame (ND,H)

Radicula palustris (L.) Moench. Soursley Lake. Grand Trunk RR., Crumstown.

Radicula hispida (Desv.) Britton. Notre Dame.

Sisymbrium Nasturtium aquaticum L. Four-mile bridge. I.I.I. RR. (ND,H)

Armoracia rusticana Gaertn. Escaped extensively at Lakeville.

Neobeckia aquatica (Eaton) Greene. Backwater of St. Joseph River, St. Mary's.

Lepidium campestre (L.) R.Br. Notre Dame. Studebaker Woods. Between Chain Lakes and Lydick. (ND,H)

Lepidium virginicum L. Notre Dame. North of North Liberty. (ND,D,H)

Lepidium apetalum Robinson. Oliver's, South Bend.

Thlaspi arvense L. Notre Dame campus. St. Mary's.

Thlaspi perfoliatum L. Notre Dame campus.

Sophia pinnata (Walt.) Howell. Notre Dame. St. Mary's.

Cheirinia cheiranthoides (L.) Link. Grand Trunk RR., west of South Bend. Between Chain Lakes and Lydick.

Cheirinia inconspicua (S. Wats.) Britton. Lydick. (H)

Erysimum officinale L. (D,H)

- Norta altissima* (L.) Britton. St. Mary's.
Conringia orientalis (L.) Dumort. I.I.I. RR., Notre Dame.
Hesperis matronalis L. St. Mary's. I.I.I. RR. bridge, Notre Dame. (ND,H)
Arabiopsis Thaliana (L.) Britton. Notre Dame. Webster's Crossing. Red Mill. (ND,D,H)
Barbarea vulgaris R. Br. Notre Dame. (ND,D)
Barbarea stricta Andr. St. Mary's. (ND,H)
Arabis lyrata L. Woods, north of Notre Dame.
Arabis dentata T. & G. Near six-mile swamp.
Arabis hirsuta (L.) Scop. North of St. Mary's.
Arabis glabra (L.) Bernh. Notre Dame. (H)
Arabis laevigata (Muhl.) Poir. Ravine, St. Mary's Healthwin. (ND,D,L)
Arabis canadensis L. Notre Dame. Northwest of Notre Dame. (ND,H)
Arabis Drummondii A. Gray. Woods, east of Notre Dame. Ravine, St. Mary's. (ND,H)
Cardamine pennsylvanica Muhl. Studebaker Woods. Webster's Crossing. Notre Dame. Ravine, St. Mary's. (ND,H)
Cardamine Douglassii (Torr.) Britton. Ravine, St. Mary's. (ND,H)
Cardamine bulbosa (Schreb.) B.S.P. St. Mary's. (ND,D,H)
Dentaria laciniata Muhl. St. Mary's. (ND,D)
Sinapis alba L. Notre Dame.
Sinapis arvensis L. Notre Dame.
Brassica nigra (L.) Koch. (D)
Brassica juncea (L.) Cosson. Between Chain Lakes and Lydick.
Diplotaxis tenuifolia (L.) DC. Near Kankakee River, Greene Township. (ND,H,L)

Capparidaceae

- Jacksonia trifoliata* Raf. Common along the banks of St. Joseph River. (ND,L)

Sarraceniaceae

- Sarracenia purpurea* L. Chain Lakes. Swamp, north of Bass Lake. North Liberty Swamp. Swamp, west of Sousley Lake. (ND,H,L)

Droseraceae

- Drosera rotundifolia* L. Six-mile Swamp.

Crassulaceae

- Sedum triphyllum* (Haw.) S. F. Gray. Notre Dame. Lakeville. North Liberty.
Sedum acre L. Notre Dame, escaped from gardens and cemetery. Mishawaka.

Penthoraceae

- Penthorum sedoides* L. Notre Dame. (ND,D)

Parnassiaceae

- Parnassia caroliniana* Michx. Chain Lakes. North Liberty Bog. North of Notre Dame. (ND,H,L)

Saxifragaceae

- Micranthes pennsylvanica* (L.) Haw. Red Mill. Granger. North of North Liberty. (ND,D)

Heuchera hirsuticaulis (Wheelock) Rydb. Notre Dame, St. Joseph River.

Granger. Chain Lakes. (ND,D)

Mitella diphylla L. Red Mill. Ravine, St. Mary's. (ND,D)

Chrysosplenium americanum Schw. Red Mill. (ND,H)

Hydrangeaceae

Philadelphus coronarius L. Notre Dame, escaped. Maintains itself well under very unfavorable conditions.

Hamamelis virginiana L. Notre Dame campus. I.I.I. RR., Notre Dame.

Grossulariaceae

Ribes sativum Syme. Notre Dame, east and north. Along St. Joseph River. (ND,D,H)

Ribes odoratum Wendl. Notre Dame. Webster's Crossing. Escaped. (ND,H)

Grossularia hirtella (Michx.) Spach. Six-mile Swamp. (ND,H)

Grossularia Cynosbati (L.) Mill. Notre Dame. Lakeville. (ND,D,H)

Platanaceae

Platanus occidentalis L. Throughout the County. (ND,H)

Spiraeaceae

Opulaster opulifolius (L.) Kuntze. St. Mary's, along the bank of the river.

Spiraea alba DuRoi. Northwest of Notre Dame. (ND,D)

Spiraea tomentosa L. Notre Dame. North of Webster's Crossing. (ND,D)

Spiraea japonica L. Notre Dame, escaped in the woods.

Rosaceae

Potentilla canadensis L. Notre Dame, near M.C. RR. (ND,H)

Potentilla monspeliensis L. Notre Dame. (ND,D,H)

Potentilla argentea L. Notre Dame. (ND,D,H)

Potentilla recta L. Oliver's, South Bend. Notre Dame.

Comarum palustre L. Chain Lakes. Bass Lake. North of Bass Lake. (ND,H,L)

Fragaria grayana Vilmorin. Notre Dame.

Fragaria virginiana Duchesne. Southeast of Notre Dame.

Fragaria vesca L. Notre Dame. St. Mary's Studebaker Woods.

Dasiphora fruticosa (L.) Rydb. Chain Lakes. Bass Lake. North of Bass Lake. Six-mile Swamp. (ND,H,L)

Drymocallis agrimonioides (Pursh) Rydb. Notre Dame campus. Chain Lakes.

Agrimonia gryposepala Wallr. Notre Dame. Studebaker Woods. (ND,D,H)

Agrimonia mollis (T. & G.) Britton. Southeast of Notre Dame. Studebaker Woods. (ND,D)

Agrimonia striata Michx. Southwest of Notre Dame.

Geum virginianum L. North Liberty Swamp. (ND,H)

Geum canadense Jacq. Notre Dame. Granger. Studebaker Woods. Turkey Creek Swamp. (ND,D,H)

Geum strictum Ait. Notre Dame. Chain Lakes. West of South Bend. (ND,D,H,L)

Stylipus vernus Raf. Notre Dame. South Bend. (ND,D,H)

Rubus idaeus var. *strigosus* (Michx.) Maxim. Swamps about Lakeville. (ND,D,G)

Rubus occidentalis L. Notre Dame. Ravine, St. Mary's. Studebaker Woods. (ND,D,H)

Rubus triflorus Richards. Grand Trunk RR., near Crumstown. Turkey Creek Swamp. Swamps near Lakeville. Six-mile Swamp. (ND,G,H)

Rubus allegheniensis Porter. Southeast of Notre Dame. Studebaker Woods.

Rubus baileyanus Britton. Webster's Crossing. (ND,D)

Rubus flagellaris Willd. (D)

Rosa rubiginosa L. Chain Lakes.

Rosa canina L. Webster's Crossing. Lakeville. (ND,D)

Rosa palustris Marsh. (D)

Rosa virginiana Mill. South Bend. Crumstown. Chain Lakes. (ND,L)

Rosa carolina var. *grandiflora* (Crepin) Farwell. (D)

Rosa pratincola Greene. Notre Dame.

Malaceae

Sorbus scopulina Greene. St. Joseph River. North Liberty Bog. Northeast of Walkerton. Six-mile Swamp. (ND,D,H,L)

Pyrus communis L. Throughout the County.

Malus glaucescens Rehder. Notre Dame, east and southeast. Studebaker Woods. Chain Lakes. Lakeville.

Malus sylvestris Mill. Notre Dame, escaped.

Adenorachis atropurpurea (Britton) Nwd. Notre Dame. Webster's Crossing. (ND,D)

Adenorachis melanocarpa (Michx.) Nwd. (D)

Adenorachis floribunda (Spach.) Nwd. (D)

Amelanchier canadensis (L.) Medic. Notre Dame. Southeast of Notre Dame. Chain Lakes. Turkey Creek Swamp. (ND,H,L)

Amelanchier laevis Wiegand. (D)

Amelanchier humilis Wiegand. Southeast of Notre Dame. Webster's Crossing. Chain Lakes.

Crataegus Crus galli L. Notre Dame. Studebaker Woods. (ND,H)

Crataegus punctata Jacq. Studebaker Woods. Lakeville.

Crataegus Jesupi Sargent. Notre Dame. Studebaker Woods.

Crataegus coccinea L. Notre Dame. Studebaker Woods.

Crataegus Brainerdi Sargent. Notre Dame.

Crataegus Calpodendron (Ehrh.) Medic. Lost Lake. Notre Dame. Turkey Creek Swamp.

Amygdalaceae

Prunus americana Marsh. Southeast of Notre Dame. (ND,H)

Prunus pennsylvanica L. Northeast of Walkerton. (ND,D)

Prunus pumila L. Webster's Crossing. Near Lakeville.

Padus virginiana (L.) Miller. Woods, southeast of Notre Dame. (ND,D)

Caesalpiniaceae

Cercis canadensis L. North of Notre Dame. Four-mile bridge.

Cassia marilandica L. Notre Dame. Southwest of Notre Dame.

Gleditsia triacanthos L. North of Lakeville. (ND,H,L)

Gymnocladus dioica (L.) Koch. North of Notre Dame. Southwest of Whar-ton Lake. Southwest of Walkerton. North of Lakeville. (ND,D,H,L)

Fabaceae

- Baptisia tinctoria* (L.) R.Br. Webster's Crossing. Chain Lakes.
Baptisia leucantha T. & G. (D,H)
Crotalaria sagittalis L. Notre Dame, M.C. RR.
Lupinus perennis L. Chain Lakes. Notre Dame, I.I.I. RR., M.C. RR.
 (ND,D,H)
Medicago sativa L. Notre Dame. Studebaker Woods. (ND,H)
Medicago lupulina L. Notre Dame.
Melilotus alba Desv. Notre Dame. (ND,H)
Melilotus officinalis (L.) Lam. Abundant in waste places. (ND,H)
Chrysaspis agraria Greene. Notre Dame. (ND,D,H)
Chrysaspis dubia Greene. St. Mary's. (ND,H)
Chrysaspis procumbens Desv. Notre Dame. Chain Lakes.
Trifolium arvense L. Northwest of Notre Dame. (ND,D,H)
Trifolium pratense L. Chain Lakes, albino (ND,H)
Trifolium hybridum L. Notre Dame campus. (H)
Trifolium repens L. Notre Dame. St. Mary's. (ND,H)
Psoralea tenuiflora Pursh. Notre Dame. I.I.I. RR.
Amorpha canescens Pursh. Notre Dame. Near Kankakee River, Green Township. (ND,D,H,L)
Cracca virginiana var. *holosericea* (Nutt.) T. & G. Notre Dame. Between Chain Lakes and Lydick. (ND,D,H)
Robinia Pseudo Acacia L. Notre Dame. (ND,H)
Astragalus carolinianus L. Notre Dame, along the St. Joseph River. Healthwin. St. Joseph Lake, Notre Dame. (ND,L)
Meibomia nudiflora (L.) Kuntze. Studebaker Woods.
Meibomia Michauxii Vail. Notre Dame. Studebaker Woods.
Meibomia sessilifolia (Torr.) Kuntze. Notre Dame. Four-mile bridge. I.I.I. RR.
Meibomia canescens (L.) Kuntze. (D)
Meibomia bracteosa (Michx.) Kuntze. Notre Dame. Studebaker Woods. (ND,H)
Meibomia paniculata (L.) Kuntze. Notre Dame. Studebaker Woods. (ND,H)
Meibomia laevigata (Nutt.) Kuntze. Notre Dame. I.I.I. RR.
Meibomia acuminata (Michx.) Blake. Studebaker Woods.
Meibomia canadensis (L.) Kuntze. Notre Dame, I.I.I. RR. (ND,H)
Meibomia rigida (ELL.) Kuntze. Four-mile bridge.
Meibomia marilandica (L.) Kuntze. Southeast of Notre Dame. (ND,D)
Lespedeza frutescens (L.) Britton. Studebaker Woods. Chain Lakes. Notre Dame, I.I.I. RR. Webster's Crossing. (ND,D,H)
Lespedeza virginica (L.) Britton. Southeast of Notre Dame. (ND,H)
Lespedeza capitata (Michx.) Nwd. North of Notre Dame. (ND,D,H)
Vicia cracca L. Notre Dame. (ND,H)
Vicia villosa Roth. Notre Dame. West of Chamberlain Lake.
Vicia americana Muhl. Ravine, St. Mary's. (ND,H)
Vicia caroliniana Walt. Notre Dame. Chain Lakes. (ND,D,H)

- Lathyrus venosus* L. Ravine, St. Mary's. (ND,H)
Lathyrus myrtifolius Muhl. Chain Lakes. Notre Dame, St. Joseph Lake.
Lathyrus palustris L. Oliver's, South Bend. Grand Trunk RR. near Crumstown. State ditch. Turkey Creek Swamp.
Lathyrus ochroleucus Hook. Notre Dame, around the lakes.
Lathyrus latifolius L. Notre Dame. Near Mud Lake. (ND,H,L)
Apios tuberosa Moench. Notre Dame. Near St. Joseph River.
Falcata comosa (L.) Kuntze. Four-mile bridge. Studebaker Woods. Notre Dame, near St. Joseph River.
Vigna sinensis (L.) Endl. Webster's Crossing. Found escaped after first year's planting in cultivation.

Geraniaceae

- Geranium robertianum* L. Studebaker Woods. (ND,D)
Geranium maculatum L. Notre Dame. (ND,D,H)
Geranium carolinianum L. Grand Trunk RR. near Crumstown. East of Notre Dame. (ND,H)
Geranium Bicknellii Britton. Notre Dame.
Geranium pusillum L. Ravine, St. Mary's.
Geranium pusillum L. Ravine, St. Mary's.
Erodium cicutarium (L.) L'Her. Notre Dame.

Oxalidaceae

- Ionoxalis violacea* (L.) Small. St. Mary's. Four-mile bridge. Red Mill. (ND,H,L)
Xanthoxalis stricta Small. Webster's Crossing. Northeast of Notre Dame. (ND,H)
Xanthoxalis corniculata (L.) Small. Notre Dame. St. Mary's. Chain Lakes.

Linaceae

- Linum usitatissimum* L. Notre Dame.
Nezera virginiana Nwd. Notre Dame.

Balsaminaceae

- Impatiens biflora* Walt. Ravine, St. Mary's.
Impatiens pallida Nutt. Notre Dame. Studebaker Woods. Wharton Lake. Southwest of Walkerton. (ND,D)

Limnanthaceae

- Floerkea proserpinacoides* Willd. Studebaker Woods. (ND,D,L)

Rutaceae

- Xanthoxylum americanum* Mill. Notre Dame. Red Mill. Studebaker Woods. St. Mary's, ravine. (ND,H,L)
Ptelea trifoliata L. St. Mary's. Notre Dame. (ND,D)

Simaroubaceae

- Ailanthus altissima* (Mill.) Swingle. Notre Dame. (ND,H)

Polygalaceae

- Polygala verticillata* L. North of Notre Dame. Chain Lakes. Healthwin. (ND,H)
Polygala viridescens L. Webster's Crossing. (ND,H)
Polygala Senega L. Six-mile Swamp. (ND,H,L)
Polygala polygama Walt. West of Notre Dame. West of Chamberlain Lake.

Euphorbiaceae

- Acalypha virginica* L. Notre Dame. St. Mary's. Studebaker Woods. (ND,D)
Chamaesyce humistrata (Engelm.) Small. South Bend.
Chamaesyce Preslii (Guss.) Arthur. Notre Dame. Studebaker Woods.
Agaloma corollata (L.) Raf. Notre Dame. I.I.I. RR. Walkerton. (ND,H,L)
Tithymalus Cyparissias (L.) Hill. Notre Dame. (ND,H)
Tithymalus Peplus (L.) Hill. North of Notre Dame. St. Mary's, river bank.
 (ND,H)
Tithymalus commutatus (Engelm.) Kl. & Garcke. Notre Dame. Webster's
 Crossing. (ND,D,H)
Poinsettia dentata (Michx.) Small. St. Mary's. North of Chain Lakes.
 (ND,H,L)

Callitricheae

- Callitriche* sp. Soursley Lake. Plant neither in good fruiting nor vegetative
 condition for determination.

Anacardiaceae

- Rhus copallina* L. Road to Red Mill. Notre Dame. Chain Lakes. (ND,D)
Rhus typhina L. Notre Dame. St. Mary's, river bank. (ND,D,H)
Rhus glabra L. Notre Dame campus. Red Mill. Studebaker Woods. Four-
 mile bridge. (ND,D,H). *R. glabra* hybridizes with *R. typhina* at Boy
 Scout Reservation.
Schmaltzia crenata (Mill.) Greene. Boy Scout Reservation, northwest of
 Notre Dame. This is the only station for northern Indiana. (ND,D,L)
Toxicodendron pubescens Mill. North of Notre Dame. Road to Red Mill.
 (ND,H)

Ilicaceae

- Ilex verticillata* (L.) A. Gray. Near Mishawaka. Granger. Chain Lakes.
 Turkey Creek Swamp. North Liberty Swamp. (ND,D,H)
Nemopanthus mucronata (L.) Trelease. North Liberty Swamp. (ND,D,L)

Celastraceae

- Euonymus obovatus* Nutt. Studebaker Woods. Lakeville. Four-mile bridge.
 (ND,D)
Euonymus atropurpureus Jacq. Southeast of Notre Dame. Studebaker Woods.
 (ND,H)
Celastrus scandens L. Notre Dame. Ravine, St. Mary's. Red Mill. (ND,D)

Staphyleaceae

- Staphylea trifolia* L. Notre Dame. Ravine, St. Mary's. Chain Lakes. Health-
 win. (ND,H,L)

Aceraceae

- Acer saccharum* Marsh. Ravine, St. Mary's. (ND,H)
Acer nigrum Michx. (D,H)
Rulac Nuttallii Nwd. St. Mary's, M.C. RR. Notre Dame. Studebaker Woods.
 (ND,H)
Acer rubrum L. (D)
Acer saccharinum L. (ND,H)

Aesculaceae

- Pavia glabra* Spach. Woods off Dragon Highway, southeast of Mishawaka.

Rhamnaceae

- Rhamnus Frangula* L. Sousley Lake. Notre Dame, Quadrangle.
Apetlorhamnus alnifolia (L'Her.) Nwd. Lydick. Six-mile Swamp.
Ceanothus americanus L. Notre Dame. Chain Lakes. (ND,D)

Vitaceae

- Vitis labrusca* L. (D)
Vitis aestivalis var. *bicolor* (LeConte) Britton & Brown. Studebaker Woods.
 (ND,D,H)
Vitis vulpina L. Woods, north of Notre Dame. (ND,D,H)
Vitis cordifolia Michx. (D)
Pseodera quinquefolia (L.) Greene. Granger. (ND,D,H)

Tiliaceae

- Tilia glabra* Vent. Near New Carlisle. (ND,D,H)

Malvaceae

- Althea officinalis* L. On way to Galien, Mich.
Malva rotundifolia L. Notre Dame. (ND,H)
Abutilon Theophrasti Med. Southeast of Notre Dame.
Hibiscus trionum L. Northwest of Notre Dame. (ND,L)

Hypericaceae

- Hypericum prolificum* L. Red Mill. Boy Scout Reservation.
Hypericum densiflorum Pursh. Boy Scout Reservation. (ND,L)
Hypericum perforatum L. Notre Dame. (ND,D,H)
Hypericum punctatum Lam. Webster's Crossing.
Hypericum boreale (Britton) Bicknell. (D)
Hypericum mutilum L. Webster's Crossing.
Hypericum majus (A. Gray) Britton. Notre Dame.
Hypericum canadense L. Webster's Crossing.
Triadenum virginicum (L.) Raf. (D)

Cistaceae

- Helianthemum canadense* (L.) Michx. Chain Lakes. Granger. Ravine, St.
 Mary's. (ND,D,H)
Lechea minor L. Notre Dame.
Lechea mucronata Raf. Southeast and north of Notre Dame. Webster's
 Crossing. (ND,D,H)
Lechea Leggettii Britton & Hollick. Webster's Crossing. (ND,D)

Violaceae

- Viola pedata* L. Webster's Crossing. Along banks of St. Joseph River.
 (ND,H)
Viola palmata L. St. Mary's. Webster's Crossing. (ND,H)
Viola papilionacea Pursh. Studebaker Woods. (ND,H)
Viola sororia Willd. Southeast of Notre Dame. Studebaker Woods.
 (ND,D,H)
Viola cucullata Ait. Four-mile bridge. Webster's Crossing. Near Crumstown.
Viola sagittata Ait. Webster's Crossing. Granger. Southeast of Notre Dame.
 (ND,H)
Viola blanda Willd. (H)
Viola pallens (Banks) Brainerd. Webster's Crossing. Chain Lakes. Crumstown.

- Viola primulifolia* L. Chain Lakes. (ND,H)
Viola lanceolata L. Webster's Crossing. North Liberty. (ND,H)
Viola eriocarpa Schw. Ravine, St. Mary's. Stuebaker Woods. Chain Lakes. (ND,D,H,L)
Viola pubescens Ait. Stuebaker Woods. Four-mile bridge. (ND,H)
Viola canadensis L. South of South Bend. (ND,H,L)
Viola striata Ait. Notre Dame, near the lakes. St. Mary's. Stuebaker Woods. (ND,D,H,L)
Viola conspersa Reichenb. Stuebaker Woods. North Liberty. (ND,D,H)
Viola rostrata Pursh. Stuebaker Woods. Northeast of North Liberty. (ND,D,H,L)
Viola arvensis Murray. Webster's Crossing.
Cubelium concolor (Forster) Raf. St. Mary's. Southwest of Notre Dame. Ryan's Woods. I.I.I. RR. near Indian Graveyard. (ND,L)

Cactaceae

Opuntia humifusa Raf. Notre Dame, cemetery.

Thymeleaceae

Dirca palustris L. (D)

Elaeagnaceae

Lepargyrea argentea (Nutt.) Greene. I.I.I. RR., Notre Dame. Along St. Joseph River. (ND,H,L)

Lythraceae

Decodon verticillatus (L.) Ell. Stuebaker Woods. Chain Lakes.
var. *laevigatus* T. & G. (D)
var. *pubescens* T. & G. (D)
Lythrum alatum Pursh. Notre Dame. Six-mile Swamp. (ND,D)

Melastomaceae

Rhexia virginica L. Notre Dame.

Onagraceae

Ludwigia sphaerocarpa Ell. Six-mile Swamp.
Ludwigia alternifolia L. Webster's Crossing.
Ludwigia polycarpa Short & Peter. Soursley Lake.
Chamaenerion angustifolium (L.) Scop. South Shore RR., west of South Bend. (ND,D)
Epilobium coloratum Muhl. Chain Lakes. St. Mary's. (ND,D,H)
Epilobium adenocaulon Haussk. Stuebaker Woods.
Oenothera biennis L. Notre Dame. (H)
Oenothera muricata L. North Liberty. (H)
Raimannia laciniata (Hill) Rose. St. Mary's. Chain Lakes. (ND,H,L)
Raimannia rhombipetala (Nutt.) Rose. Notre Dame.
Kneiffia fruticosa (L.) Raimann. Granger. Six-mile Swamp. (ND,L)
Gaura coccinea Pursh. Lydick. (ND,L)
Gaura biennis L. Ravine, St. Mary's. I.I.I. RR. bridge, Notre Dame. (ND,L)
Circeaea lutetiana L. Notre Dame. Stuebaker. (ND,D)

Araliaceae

Aralia racemosa L. North of Notre Dame. Stuebaker Woods. (ND,D)
Aralia nudicaulis L. Six-mile Swamp. (ND,D,H)

Panax quinquefolium L. Notre Dame. Studebaker Woods. (ND,H)

Panax trifolium L. Studebaker Woods. (ND,D)

Ammiaceae

Sanicula marilandica L. Mishawaka. Studebaker Woods. (ND,H,L)

Sanicula gregaria Bicknell. Studebaker Woods. Notre Dame. Ravine, St. Mary's. (ND,D)

Sanicula canadensis L. Southeast and east of Notre Dame. St. Mary's. Studebaker Woods. Mud Lake. (ND,D)

Sanicula trifoliata Bicknell. Wharton Lake. Studebaker Woods. Ravine, St. Mary's. (ND,D,L)

Daucus carota L. (D)

Washingtonia Claytoni (Michx.) Britton. St. Mary's. Studebaker Woods. (ND,D,H)

Chaerophyllum procumbens (L.) Crantz. Ravine, St. Mary's. Studebaker Woods. (ND,H)

Deringa canadensis (L.) Kuntze. Notre Dame. (ND,D)

Pastinaca sativa L. Notre Dame. (ND,D)

Angelica atropurpurea L. Notre Dame. Studebaker Woods. (ND,H)

Oxypolis rigidus (L.) Raf. Notre Dame. Studebaker Woods.

Thaspium trifoliatum (L.) Britton. Notre Dame. Studebaker Woods. (ND,H)

Thaspium barbinode (Michx.) Nutt. Ravine, St. Mary's. Notre Dame, near St. Joseph Lake. (ND,H)

Taenidia integerrima (L.) Drude. Along St. Joseph River. (ND,H)

Zizia aurea (L.) Koch. (D)

Hydrocotyle umbellata L. St. Mary's. Chain Lakes.

Erigenia bulbosa (Michx.) Nutt. Studebaker Woods. (ND,D,H)

Conium maculatum L. Notre Dame. Has disappeared.

Sium cicutaefolium Schrank. St. Mary's. (ND,H)

Cicuta bulbifera L. Chain Lakes. St. Mary's.

Cicuta maculata L. (D,H)

Cornaceae

Svida rugosa (Lam.) Small. Along St. Joseph River.

Svida Amomum (Mill.) Small. Southeast of Notre Dame. (ND,D,H)

Svida stolonifera (Michx.) Small. Lakeville. Six-mile Swamp. Along St. Joseph River. (ND,D)

Svida femina (Mill.) Small. Notre Dame. (ND,D,H)

Svida alternifolia (L.F.) Small. Red Mill. Healthwin. (ND,L)

Cynoxylon floridum (L.) Raf. Red Mill. (ND,D)

Nyssa sylvatica Marsh. Notre Dame. Studebaker Woods.

Pyrolaceae

Pyrola americana Sweet. Notre Dame.

Pyrola chlorantha Sw. Chain Lakes. North of Bass Lake. (ND,H)

Monotropaceae

Monotropa uniflora L. Boy Scout Reservation. (ND,D)

Hypopitys lanuginosa (Michx.) Nutt. Chain Lakes.

Ericaceae

Chamaedaphne calyculata (L.) Moench. Chain Lakes. Lydick. (ND,D)

Andromeda Polifolia L. Chain Lakes.

Epigaea repens L. Webster's Crossing. Roseland Woods. (ND,L)

Gaultheria procumbens L. Webster's Crossing.

Vacciniaceae

Gaylussacia baccata (Wang.) K. Koch. Webster's Crossing. Chain Lakes. (ND,D)

Vaccinium pennsylvanicum Lam. (H)

Vaccinium corymbosum L. Chain Lakes. Lydick. (ND,D)

Vaccinium vacillans Kalm. North Liberty. (ND,D)

var. *crinatum* Fern. (D)

Oxycoccus macrocarpus (Ait.) Pursh. Chain Lakes. North Liberty. Walker-ton. (ND,L)

Primulaceae

Lysimachia quadrifolia L. Notre Dame. St. Mary's. Granger. (ND,D)

Lysimachia terrestris (L.) B.S.P. Notre Dame. St. Mary's. (ND,D)

Lysimachia Nummularia L. St. Mary's. (ND,H)

Steironema ciliatum (L.) Raf. St. Mary's. Studebaker Woods.

Steironema quadriflorum (Sims.) Hitchc. Notre Dame.

Naumburgia thyrsiflora (L.) Duby. Notre Dame. Chain Lakes. Studebaker Woods. (ND,H)

Trientalis americana Pursh. Turkey Creek Swamp. (ND,L)

Dodecatheon Meadia L. Grand Trunk RR., west of South Bend. Oliver's, South Bend. Six-mile Swamp. (ND,H,L)

Oleaceae

Fraxinus americana L. Studebaker Woods. (ND,D,H)

Fraxinus nigra Marsh. (ND,D,H)

Fraxinus pennsylvanica Marsh. (ND,D,H)

Fraxinus quadrangulata Michx. Studebaker Woods. (ND,H)

Gentianaceae

Sabbatia angularis (L.) Pursh. Sousley Lake. (ND,H)

Gentiana crinita Froel. Webster's Crossing. St. Mary's. Chain Lakes. Six-mile Swamp. (ND,H,L)

Gentiana procera Holm. Chain Lakes.

Gentiana quinquefolia L. Near Red Mill. (ND,L)

Dasystephana saponaria (L.) Small. Notre Dame, I.I.I. RR.

Dasystephana Andrewsii (Griseb.) Small. North of Chain Lakes. Six-mile Swamp. (ND,H,L)

Dasystephana flavida (A. Gray) Britton. Notre Dame.

Frasera carolinensis Walt. North of Notre Dame. Webster's Crossing. Red Mill. Along St. Joseph River. (ND,H,L)

Menyanthaceae

Menyanthes trifoliata L. Chain Lakes. North Liberty Swamp. (ND,H,L)

Apocynaceae

Apocynum androsaemifolium L. Notre Dame. Grand Trunk RR., west of South Bend. Crumstown. (ND,H)

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Apocynum cannabinum L. Sample St. Bridge, South Bend. Along St. Joseph River.

Apocynum tomentellum Nwd. Notre Dame.

Apocynum isophyllum Greene. Notre Dame, near St. Joseph Lake. I.I.I. RR.

Apocynum medium Greene. Notre Dame. Sousley Lake. Southwest of Wharton Lake. Along the Kankakee River. (ND,H,L)

Asclepiadaceae

Asclepias tuberosa L. Notre Dame. Northwest of Notre Dame. (ND,D,H)

Asclepias purpurascens L. Notre Dame. Studebaker Woods. (ND,H,L)

Asclepias sullivantii Engelm. Notre Dame.

Asclepias amplexicaulis J. E. Smith. Lydick. West of Chamberlain Lake (ND,H,L)

Asclepias exaltata (L.) Muhl. Notre Dame. (ND,D,H)

Asclepias syriaca L. Notre Dame. (ND,H)

Asclepias verticillata L. St. Mary's. Webster's Crossing. (ND,D,L)

Acerates viridiflora (Raf.) Eaton. West of St. Mary's. Southeast of Notre Dame.

Acerates floridana (Lam.) A. S. Hitchc. Southeast of Walkerton. (ND,D)

Ipomoea pandurata (L.) Meyer. Notre Dame.

Convolvulus sepium L. Notre Dame. (ND,H)

Calyptegia spithamea Pursh. Notre Dame. Studebaker Woods.

Convolvulus arvensis L. Along Grand Trunk RR. (ND,H)

Cuscutaceae

Cuscuta Gronovii Willd. Notre Dame. St. Mary's. Studebaker Woods. Red Mill. (ND,D,H)

Polemoniaceae

Phlox paniculata L. Notre Dame.

Phlox maculata L. Chain Lakes. Six-mile Swamp. (ND,D,H,L)

Phlox pilosa L. Ravine, St. Mary's. North of Notre Dame. Chain Lakes.

var. *virens* Wherry. Six-mile Swamp. (ND,D,H)

Phlox divaricata L. Notre Dame. (ND,D,H)

Phlox bifida Beck. Notre Dame.

var. *glandifera* Wherry. Webster's Crossing.

Phlox Stellaria A. Gray. St. Mary's along the river bank. (ND,H)

Phlox subulata L. Along the St. Joseph River.

var. *ciliata* (Brand) Wherry. Six miles north of Notre Dame near boundary.

Polemonium reptans L. North of St. Mary's. Near Crumstown. Six-mile Swamp. Southwest of Notre Dame. (ND,D,H,L)

Hydrophyllaceae

Hydrophyllum virginianum L. Notre Dame. Studebaker Woods. (ND,D,H)

Hydrophyllum canadense L. Studebaker Woods. Southwest of Wharton Lake. (ND,D,L)

Decemium appendiculatum (Michx.) Brand. Notre Dame. Studebaker Woods. (ND,D,H)

Boraginaceae

- Cynoglossum officinale* L. Notre Dame. Near Six-mile Swamp. (ND,D)
Lappula echinata Gilib. Oliver's, South Bend.
Lappula virginiana (L.) Greene. Notre Dame. Studebaker Woods. (ND,D)
Myosotis scorpioides L. About 9 mi. east of South Bend, along St. Joseph River. (ND,D,L)
Lithospermum arvense L. Notre Dame. (ND,D,H)
Lithospermum carolinense (Walt.) MacM. Webster's Crossing. Granger. Notre Dame. West of Chamberlain Lake. (ND,D,L)
Lithospermum canescens (Michx.) Lehm. Notre Dame. Webster's Crossing. (ND,H)

Verbenaceae

- Verbena hastata* L. Notre Dame, along St. Joseph River.
Verbena angustifolia Michx. I.I.I. RR. two miles from boundary.
Verbena stricta Vent. Northwest of Notre Dame. St. Mary's. (ND,D,H)
Verbena bracteosa Michx. Notre Dame. West of Chamberlain Lake. (ND,H,L)
V. hastata L. x *V. bracteosa* Michx. St. Mary's, river bank. (ND,L)
Lippia lanceolata Michx. Along the St. Joseph River.

Labiatae

- Teucrium canadense* L. Notre Dame. (ND,D,H)
Scutellaria lateriflora L. St. Mary's. Chain Lakes.
Scutellaria incana Muhl. Sousley Lake.
Scutellaria pilosa Michx. Notre Dame. (ND,H,L)
Scutellaria parvula Michx. Notre Dame. Four-mile bridge. Along St. Joseph River. (ND,H)
Scutellaria galericulata L. Granger. Chain Lakes. (ND,D,L)
Marrubium vulgare L. North of Notre Dame. (ND,H)
Agastache nepetoides (L.) Kuntze. St. Mary's, ravine. Studebaker Woods. North of Lakeville. (ND,L)
Agastache scrophulariaefolia (Willd.) Kuntze. Studebaker Woods. (ND,D)
Nepeta Cataria L. Notre Dame. (ND,D,H)
Glechoma hederacea L. St. Mary's. Notre Dame. (ND,H)
Prunella vulgaris L. Notre Dame. (ND,H)
Dracocephalum virginianum L. Notre Dame, St. Joseph River. (ND,L)
Leonurus Cardiaca L. Notre Dame. (ND,D,H)
Lamium amplexicaule L. Notre Dame.
Lamium purpureum L. Notre Dame. (ND,D,H)
Stachys hyssopifolia Michx. Southeast of Notre Dame.
Stachys ambigua (A. Gray) Britton. Near Wharton Lake. Sousley Lake.
Stachys palustris L. Notre Dame.
Stachys tenuifolia Willd. St. Mary's.
Stachys aspera Michx. Notre Dame. (ND,D)
Monarda fistulosa L. Notre Dame. (ND,D,H)
Monarda punctata L. Notre Dame. West of Chamberlain Lake on sandy dunes.
Blephilia ciliata (L.) Raf. Red Mill. Notre Dame, St. Joseph River. (ND,H)

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- Blephilia hirsuta* (Pursh) Torr. Notre Dame, St. Joseph River. Stuebaker Woods. (ND,D,L)
Hedeoma pulegioides (L.) Pers. Notre Dame. North of St. Mary's. Stuebaker Woods. (ND,D,H)
Thymus Serpyllum L. Notre Dame campus, east side near the Church.
Koellia virginiana (L.) MacM. Notre Dame. (ND,H)
Koellia flexuosa (Walt.) MacM. Notre Dame.
Lycopus virginicus L. St. Mary's.
Lycopus asper Greene. St. Mary's. Stuebaker Woods.
Lycopus americanus Muhl. Notre Dame. Stuebaker Woods. (ND,H)
Mentha spicata L. Notre Dame. Stuebaker Woods.
Mentha piperita L. Notre Dame. (ND,H)
Mentha canadensis L. St. Mary's. Notre Dame.

Solanaceae

- Physalis pruinosa* L. Notre Dame.
Physalis virginiana Mill. North of Notre Dame. West of Chamberlain Lake. (ND,H)
Physalis heterophylla Nees. (D)
Solanum nigrum L. Stuebaker Woods.
Solanum carolinense L. Notre Dame. (ND,H)
Solanum Dulcamara L. Notre Dame. (ND,D,H)
Nycterium rostratum (Dunal.) Link. (D)
Lycium halimifolium Mill. South Bend.
Datura Stramonium L. Notre Dame.

Scrophulariaceae

- Verbascum Thapsus* L. Notre Dame. (ND,H)
Verbascum Blattaria L. St. Mary's.
Linaria vulgaris Hill. North of Notre Dame. Oliver's, South Bend. (ND,H)
Linaria canadensis (L.) Dumort. North of Notre Dame. Webster's Crossing.
Scrophularia marilandica L. Notre Dame. St. Mary's. Stuebaker Woods. Southwest of Wharton Lake. (ND,D,H)
Scrophularia lanceolata Pursh. Notre Dame. Southeast of Notre Dame. Webster's Crossing.
Chelone glabra var. *linifolia* Coleman. Notre Dame. Webster's Crossing. (ND,D)
Pentstemon hirsutus (L.) Willd. Notre Dame, I.I.I. RR. Ravine, St. Mary's. (ND,H)
Pentstemon digitalis (Sweet) Nutt. North of Notre Dame. Four-mile bridge. West of Stuebaker Woods. (ND,D)
Collinsia verna Nutt. Stuebaker Woods, 1910. Found again in the county, Mishawaka, in 1930, where it had disappeared fifteen years before. (ND,H)
Mimulus ringens L. East of Notre Dame. (ND,D,H)
Gratiola neglecta Torr. Stuebaker Woods. Turkey Creek Swamp. (ND,D,H)
Ilysanthes dubia (L.) Barnhart. St. Mary's, lowland near the river.
Synthyris Bullii (Eaton) Heller. Notre Dame, along the river bank.

- Veronica scutellata* L. Studebaker Woods. Wharton Lake. Southwest of Granger. (ND,L)
Veronica officinalis L. Studebaker Woods. Chain Lakes. (ND,D,H,L)
Veronica serpyllifolia L. Notre Dame. St. Mary's. Studebaker Woods. (ND,H)
Veronica peregrina var. *xalapensis* (H.B.K.) Pennell. Notre Dame. St. Mary's. Studebaker Woods. (ND,H)
Veronica arvensis L. North of Notre Dame. Studebaker Woods. (ND,D,H)
Leptandra virginica (L.) Nutt. (ND,D)
 f. *villosa* (Raf.) Pennell. North of Notre Dame. (ND,H)
Afzelia macrophylla (Nutt.) Kuntze. Notre Dame, along the river. (ND,L)
Aureolaria pedicularia var. *ambigens* (Fernald) Farwell. North of Notre Dame. (ND,L)
Aureolaria virginica (L.) Pennell. Notre Dame.
Agalinis paupercula (A. Gray) Britton. Notre Dame. Chain Lakes.
Agalinis purpurea (L.) Pennell. Notre Dame. Webster's Crossing.
Agalinis tenuifolia (Vahl.) Raf. Notre Dame.
Castilleja coccinea (L.) Spreng. Oliver's, South Bend. Six-mile Swamp. Mishawaka. (ND,H,L)
Pedicularis lanceolata Michx. (ND,H,L)
Pedicularis canadensis L. (D,H)

Lentibulariaceae

- Utricularia cornuta* Michx. Six-mile Swamp. (ND,H,L)
Utricularia macrorhiza LeConte. Studebaker Woods. Granger. Sousley Lake.

Orobanchaceae

- Thalesia uniflora* (L.) Britton. Ravine, near Indian Graveyard, Notre Dame.
Conopholis americana (L.F.) Wallr. North of Notre Dame. St. Mary's. Studebaker Woods.

- Leptamnium virginianum* (L.) Raf. Studebaker Woods. North of Lakeville.

Bignoniaceae

- Bignonia radicans* L. Notre Dame. (ND,H)
Catalpa bignonioides Walt. Southeast of Notre Dame. St. Mary's.
Catalpa speciosa Warder. Notre Dame. (ND,H)

Acanthaceae

- Ruellia strepens* L. Notre Dame. St. Mary's.
Ruellia ciliosa Pursh. Notre Dame. Healthwin. (ND,H,L)

Phrymaceae

- Phryma leptostachys* L. Southwest of Wharton Lake. (ND,D,H,L)

Plantaginaceae

- Plantago major* L. Notre Dame.
Plantago Rugelii Dcne. Notre Dame. (ND,D,H)
Plantago lanceolata L. North of Notre Dame. Notre Dame campus. (ND,H)
Plantago Purshii R. & S. Notre Dame, I.I.I. RR., juncture of M.C. RR. (ND,H)
Plantago aristata Michx. Northwest and east of Notre Dame. (ND,L)
Plantago virginica L. St. Mary's. Notre Dame.

Rubiaceae

- Houstonia coerulea* L. Webster's Crossing. Chain Lakes. Six-mile Swamp. (ND,D,H)
Chamisme ciliolata (Torr.) St. Mary's. Notre Dame, I.I.I. RR. Granger. (ND,H)
Cephalanthus occidentalis L. Notre Dame. (ND,D)
Mitchella repens L. Turkey Creek Swamp. Lydick. (ND,H)
Diodia teres Walt. Notre Dame, M.C. RR.
Galium Aparine L. Haag Woods. (ND,D,H)
Galium pilosum Ait. Studebaker Woods.
Galium lanceolatum Torr. (D)
Galium circaezans Michx. Notre Dame. Southeast of Notre Dame. Studebaker Woods. (ND,D,H)
Galium boreale L. Six-mile Swamp. Near Crumstown. Granger. (ND,D,H)
Galium triflorum Michx. (D)
Galium tinctorium L. Clear Lake.
Galium trifidum L. Notre Dame. (ND,H)
Galium Claytoni Michx. Chain Lakes. (ND,H)
Galium concinnum T. & G. Ravine, St. Mary's. Studebaker Woods. Granger. Swamp, I.I.I. RR. (ND,H)

Caprifoliaceae

- Sambucus canadensis* L. Notre Dame. (ND,D,H)
Sambucus pubens Michx. Notre Dame. Turkey Creek Swamp. (ND,D,H,L)
 f. *xanthocarpa* Nwd. Summit Farm, four miles west of South Bend.
Viburnum acerifolium L. Notre Dame. St. Mary's. Red Mill. Studebaker Woods. Mishawaka. (ND,D)
Viburnum affine Bush. Notre Dame. Healthwin. (ND,H,L)
 var. *hypomalacum* Blake. Notre Dame.
Viburnum cassinoides L. Notre Dame.
Viburnum Lentago L. North of Notre Dame. Turkey Creek Swamp. Six-mile Swamp. (ND,D,H)
Viburnum prunifolium L. (D,H)
Triosteum perfoliatum L. Notre Dame. Indian Graveyard. Lakeville. (ND,G,H)
Triosteum auranticum Bicknell. (H)
Symphoricarpos racemosus Michx. Notre Dame, escaped along the river.
Lonicera dioica L. Webster's Crossing.
Lonicera sempervirens L. St. Mary's. Escaped.
Xylosteum dumetorum Moench. Escaped along St. Joseph River. (ND,H)

Valerianaceae

- Valerianella radiata* (L.) Dufr. Studebaker Woods.

Dipsacaceae

- Dipsacus sylvestris* Huds. Notre Dame. St. Mary's.

Cucurbitaceae

- Micrampelis lobata* (Michx.) Greene. Notre Dame.

- Eupatorium urticaefolium* Reichard. Notre Dame. Studebaker Woods.
(ND,D,H)
- Kuhnia eupatorioides* L. Southeast of Notre Dame. (ND,H)
- Lacinaria pycnostachya* (Michx.) Kuntze. Notre Dame.
- Lacinaria scariosa* (L.) Hill. Notre Dame. (ND,H)
var. *Nieuwlandii* Lunell. Notre Dame.
var. *intermedia* Lunell. Notre Dame.
- Lacinaria spicata* (L.) Kuntze. Notre Dame. (ND,H)
- Grindelia squarrosa* (Pursh) Dunal. Found in an alfalfa field west of South Bend.
- Solidago caesia* L. Notre Dame. (ND,D)
- Solidago latifolia* L. (D)
- Solidago speciosa* Nutt. North Notre Dame. (ND,H)
- Solidago rigidiuscula* (T. & G.) Porter. Notre Dame.
- Solidago Randii* (Porter) Britton. Notre Dame.
- Solidago patula* Muhl. North of Notre Dame. Chain Lakes.
- Solidago ulmifolia* Muhl. Notre Dame. Studebaker Woods. (ND,D)
- Solidago juncea* Ait. Notre Dame.
- Solidago serotina* Ait. Studebaker Woods.
- Solidago altissima* L. Chain Lakes. (ND,D,H)
- Solidago nemoralis* Ait. Notre Dame.
- Solidago rigida* L. Notre Dame. (ND,H)
- Solidago ohioensis* Riddell. Six-mile Swamp. Notre Dame. Four-mile bridge.
(ND,L)
- Solidago Riddellii* Frank. Notre Dame. Chain Lakes.
- Euthamia graminifolia* (L.) Nutt. Chain Lakes. (ND,D,H)
- Euthamia tenuifolia* (Pursh) Greene. Notre Dame.
- Aster macrophyllus* L. Notre Dame. Ravine, St. Mary's. (ND,D)
- Aster Shortii* Hook. Studebaker Woods.
- Aster azureus* Lindl. Notre Dame. Studebaker Woods. (ND,D)
- Aster cordifolius* L. Notre Dame. Studebaker Woods. (ND,D,H)
- Aster sagittifolius* Willd. Notre Dame. Studebaker Woods. Chain Lakes.
(ND,D,H)
- Aster novae-angliae* L. Chain Lakes. Six-mile Swamp. (ND,D,H)
- Aster puniceus* L. Notre Dame.
- Aster lucidulus* (Gray) Wieg. Notre Dame. I.I.I. RR. Chain Lakes.
- Aster laevis* L. Notre Dame. Studebaker Woods. (ND,H)
- Aster lateriflorus* (L.) Britton. Studebaker Woods. (ND,D)
- Aster paniculatus* Lam. Notre Dame.
var. *simplex* (Willd.) Burg. Notre Dame.
- Aster interior* Wieg. Notre Dame. I.I.I. RR. Studebaker Woods. Chain Lakes.
(ND,D,H)
- Aster pilosus* Willd. Notre Dame.
- Aster praealtus* Poir. (?). Chain Lakes.
- Erigeron pulchellus* Michx. Notre Dame. (ND,H)
- Erigeron philadelphicus* L. North of Notre Dame. Studebaker Woods.
(ND,H)

- Erigeron annuus* (L.) Pers. Stuebaker Woods. (ND,D,H)
Erigeron ramosus (Walt.) B.S.P. Chain Lakes. Southwest of South Bend. (ND,D,H)
Leptilon canadense (L.) Britton. Notre Dame. (ND,H)
Leptilon divaricatum (Michx.) Raf. Notre Dame.
Doellingeria umbellata (Michx.) Nees. Webster's Crossing. (ND,D)
Antennaria canadensis Greene. Webster's Crossing. Stuebaker Woods. Red Mill.
Antennaria occidentalis Greene. North Liberty. Lakeville. (G)
Antennaria fallax Greene. Notre Dame. Stuebaker Woods. Chain Lakes. (ND,D)
Antennaria Parlinii Fernald. (D)
Antennaria plantaginifolia (L.) Rich. Notre Dame. Stuebaker Woods. (ND,H)
Antennaria neodioica Greene. (D,H)
Antennaria neglecta Greene. Lakeville. Four-mile bridge.
Anaphalis margaritacea (L.) Benth. & Hook. Notre Dame.
Gnaphalium decurrens Ives. (D)
Gnaphalium obtusifolium L. (D)
Inula Helenium L. Turkey Creek Road. North Liberty.
Osteospermum canadense (L.) House. (D,L)
Silphium integrifolium Michx. Notre Dame. Bogs of the County. (ND,H,L)
Silphium terebinthinaceum Jacq. Notre Dame. Bogs of County.
Heliopsis helianthoides (L.) Sweet. Notre Dame. St. Mary's. Four-mile bridge. Stuebaker Woods.
Heliopsis scabra Dunal. Notre Dame. Oliver's, South Bend.
Rudbeckia hirta L. Notre Dame. Six-mile Swamp. West of Chamberlain Lake. (ND,D,H)
Rudbeckia laciniata L. Ravine, St. Mary's.
Ratibida pinnata (Vent.) Barnhart. Notre Dame.
Brauneria purpurea Britton. Lydick.
Brauneria pallida Britton. New Catlisle.
Helianthus annuus L. Notre Dame.
Helianthus occidentalis Riddell. West of Notre Dame. (ND,D)
Helianthus giganteus L. (D)
Helianthus Maximiliani Schrad. (D).
Helianthus divaricatus L. Notre Dame.
Helianthus mollis Lam. North of Notre Dame. (ND,L)
Helianthus decapetalus L. Notre Dame. Stuebaker Woods. (ND,D)
Helianthus ambulus Watson. Vicinity of South Bend and Notre Dame.
Ridania alternifolia (L.) Kuntze. Notre Dame.
Coreopsis lanceolata L. Granger.
Coreopsis grandiflora Hogg. Lincoln Highway, near South Bend.
Coreopsis tripteris L. Notre Dame. (ND,D)
Coreopsis palmata Nutt. Notre Dame, Eddy St. (ND,D,H)
Coreopsis tinctoria Nutt. Notre Dame, escaped along roadsides.
Bidens laevis (L.) B.S.P. Stuebaker Woods.

- Bend. *Bidens cernua* L. Chain Lakes. (ND,H)
Bidens discoides (T. & G.) Britton. Studebaker Woods. (ND,D)
Bidens frondosa L. Notre Dame. Webster's Crossing.
Bidens trichosperma (Michx.) Britton. Notre Dame. Chain Lakes.
Bidens aristosa (Michx.) Britton. (D)
Galinsoga parviflora Cav. Notre Dame. (ND,H,L)
ds. Red *Helenium autumnale* L. Notre Dame. Chain Lakes.
Achillea Millefolium L. Chain Lakes. (ND,D,H)
Lakes. *Anthemis Cotula* L. Southeast Notre Dame. (ND,D)
Anthemis arvensis L. Notre Dame. St. Mary's. (ND,H)
Woods. *Chrysanthemum Leucanthemum* L. (H)
Matricaria matricarioides (Less.) Porter. Notre Dame.
Tanacetum vulgare L. Notre Dame. (ND,H)
Artemisia caudata Michx. Along banks of St. Joseph River.
Artemisia Absinthium L. Notre Dame, escaped.
Erechtites hieracifolia (L.) Raf. Notre Dame. Webster's Crossing. (ND,D)
Mesadenia tuberosa (Nutt.) Britton. Six-mile Swamp. (ND,H,L)
Mesadenia atriplicifolia (L.) Raf. (D,H)
Senecio aureus L. Studebaker Woods. Chain Lakes. (ND,D)
Senecio obovatus Muhl. Notre Dame. Webster's Crossing. (ND,D)
Senecio pauperculus Michx. North of Notre Dame. Red Mill.
D,H,L) *Cirsium lanceolatum* (L.) Hill. Notre Dame.
four-mile *Cirsium altissimum* (L.) Spreng. Notre Dame.
Cirsium arvense (L.) Scop. (ND,D,H)
Echinops sphaerocephalus L. Chain Lakes. (ND,L)

BIBLIOGRAPHY

- BRAND, A. 1913.—Hydrophyllaceae, Das Pflanzenreich, iv. 251, pp. 1-210.
BRITTON, N. L. AND A. BROWN. 1913.—Illustrated Flora of the Northeastern States and Canada. 2nd ed.
DEAM, CHARLES C. 1924.—Shrubs of Indiana. Department of Conservation of the State of Indiana. Pub. no. 44.
——— 1929.—Grasses of Indiana. Department of Conservation of the State of Indiana. Pub. no. 52.
——— 1932.—Trees of Indiana. Department of Conservation of the State of Indiana. Pub. no. 13. First revision.
FERNALD, M. L. 1929.—*Coptis trifolia* and its Eastern American representatives. *Rhodora*, vol. 31, pp. 136-142.
——— 1930.—The identity of *Juncus canadensis* and of *Juncus brevicaudatus*. *Rhodora*, vol. 32, pp. 83-88.
GEISE, SISTER MARY JOSEPH, 1931.—The Indiana species of *Cyperus*. A Thesis. U.N.D.
GREENE, EDWARD L55. 1904.—Certain Polygonaceous Genera. Leaflets, vol. 1, pp. 17-50.
——— 1898.—Critical notes on *Antennaria*. *Pittonia*, vol. 3, pp. 318-323.

- HOUSE, H. D. 1924.—Annotated list of the ferns and flowering plants of New York State. New York State Museum Bull. no. 254, pp. 1-759.
- MARIE-VICTORIN, FRERE. 1931.—*L'Anacharis canadensis*. Con. Lab. Bot. Mont., no. 18.
- MOLDENKE, HAROLD. 1932.—A discussion of tautonyms. Bull. Torr. Club, val. 59, no. 3, pp. 139-156.
- NIEUWLAND, J. A. 1910.—*Dryopteris* a synonym. Amer. Midl. Nat., val. 1, pp. 224-226.
- . 1911.—Our amphibious *Persicarias*. Amer. Midl. Nat., vol. 2, pp. 1-24, 201-247.
- . 1911-1916.—Notes on our local plants. Amer. Midl. Nat., vol. 2, 3, 4.
- . 1913.—Some Midland Dogbanes. Amer. Midl. Nat., vol. 3, pp. 53-57.
- . 1913.—*Evactoma*. Amer. Midl. Nat., vol. 3, pp. 57-59.
- . 1913.—The generic name of white pine. Amer. Midl. Nat., vol. 3, pp. 68-70.
- . 1914.—A new variety of *Sambucus*. Amer. Midl. Nat., vol. 3, p. 310.
- . 1913-1918.—Critical notes on new and old genera of plants., Amer. Midl. Nat., vol. 3, 4, 5.
- AND THEODORE JUST. 1931.—New and interesting plant records from northern Indiana. Amer. Midl. Nat., vol. 12, pp. 217-223.
- WATSON, ELBA E. 1928.—Contributions to a monograph of the genus *Helianthus*. Papers Mich. Acad. Sci., vol. 9, pp. 305-476, pls. 40.

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THE INDIANA SPECIES OF CYPERUS*

SR. M. JOSEPH GEISE, S.N.D.

The present paper is a report of the results of a study of the genus *Cyperus* as represented in the State of Indiana. The plants from which practically all data were taken were herbarium specimens collected in the state of Indiana. The genus is represented in the state by sixteen species, five varieties and two hybrids.

The following list is a record of the number of specimens (total 561), the number of species and the herbaria in which they are found.

	Specimens	Species
Charles C. Deam Herbarium -----	317	16
DePauw University Herbarium -----	20	9
The Field Museum Herbarium -----	75	13
P. E. Hebert Herbarium -----	4	4
University of Illinois Herbarium -----	27	10
University of Indiana Herbarium -----	14	8
Marcus Lyon, Jr., Herbarium -----	16	5
Missouri Botanical Garden Herbarium -----	30	8
University of Notre Dame Herbarium -----	41	10
Purdue University Herbarium -----	28	10
Wabash College Herbarium -----	32	9
University of Wisconsin Herbarium -----	90	9

The extent to which each species is distributed throughout the state is shown on maps and by the published records given after each species description. On the former, symbols are used to represent the herbaria in which the respective species may be found.

D for Chas. C. Deam, Bluffton, Indiana.
 DP for DePauw University, Greencastle, Indiana.
 F for Field Museum, Chicago, Illinois
 H for P. E. Hebert, Notre Dame, Indiana.
 I for University of Illinois, Urbana, Illinois.
 In for University of Indiana, Bloomington, Indiana.
 L for Marcus Ward Lyon, Jr., South Bend, Indiana.
 M for Missouri Botanical Garden, St. Louis, Missouri.
 ND for University of Notre Dame, Notre Dame, Indiana.
 P for Purdue University, West Lafayette, Indiana.
 W for Wabash College, Crawfordsville, Indiana.
 Wi for University of Wisconsin, Madison, Wisconsin.

Due to lack of sufficient data a few of the reported records as also some doubtful species have not been included.

*Contributions to the Fauna and Flora of Indiana. No. 2.
 (241)

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The study of the Indiana Cyperi was undertaken at the suggestion of Dr. Theodor Just, of the University of Notre Dame. For his constant interest and assistance in the work the writer is very grateful.

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CYPERUS (Tourn.) L. Sp. Pl. 44. 1753.

Annuals or perennials; roots fibrous; erect or ascending, solitary or caespitose plants, underground stem parts; culms 3 angled, leafy at the base, sheathed, jointless; leaves linear-lanceolate; inflorescence spicate umbels; involucre leaves subtending the umbels; spikelets few-to-many flowered, usually elongated, compressed or subterete, aggregated into clusters or heads, simple or compound terminal umbels; scales bifarious, imbricate, keeled, concave; rachilla winged or wingless; flowers perfect or imperfect (*C. canus*); stamens 1-3; styles 2-3 cleft, persistent or deciduous; achenes lenticular or trilateral.

KEY TO THE SUB-GENERA

Spikelets compressed; rachilla persistent.

Annuals; styles 2-cleft.

Achenes lenticular ----- *Pycneus*

Achenes triangular ----- *Papyrus*

Perennials; styles 3-cleft ----- *Eucyperus*

Spikelets terete or subterete; rachilla deciduous.

Perennials; spikelets in ovate heads ----- *Mariscus*

Annuals; spikelets in dense oblong clusters ----- *Diclidium*

KEY TO THE SPECIES

Rachilla persistent on rachis; scales deciduous.

Styles 2-cleft; achenes lenticular.

Superficial cells of achenes oblong with distinct transverse wrinkles.

Scales straw-yellow; achene black ----- *C. flavescens*

Scales dark reddish-brown; achenes yellowish-white ----- *C. Nieuwlandii*

Superficial cells of achenes oblong or quadrate without transverse wrinkles.

Scales subcoriaceous; styles slightly or not exerted ----- *C. rivularis*

Scales membranous; styles conspicuously exerted ----- *C. diandrus*

Styles 3-cleft; achenes triangular.

Rachis wingless or narrowly winged.

Annuals; stamen 1.

Scales awled ----- *C. inflexus*

- Scales apiculate not awled *C. acuminatus*
 Perennials.
 Stamen 1; scales pale, narrow; achenes linear-oblong *C. pseudovegetus*
 Stamens 2 or 3.
 Styles exserted; rootstocks stoloniferous; scales reddish-brown on upper surface; achenes white or pale *C. dentatus*
 Styles not exserted; rootstocks corm-like; scales brown; achenes brown *C. mesochorus*
 Culms rough on angles; spikelets distantly separated on rachis, raceme-like; achenes 1.2 x 2.5 mm. *C. Schweinitzii*
 Culms smooth on angles; spikelets grouped into loose heads at tip of ray; achenes 1.5 x 2 mm. *C. Houghtonii*
 Rachis winged.
 Perennials; spikelets in oblong clusters, spreading horizontally.
 Rootstocks creeping, bearing small tubers; scales brown, slightly longer than achene *C. esculentus*
 Rootstocks corm-like; scales light yellow, twice as long as achene *C. strigosus*
 Annuals; spikelets numerous, closely crowded into oblong heads; scales deciduous, leaving 2 persistent inner scales when falling *C. erythrorhizos*
 Rachilla deciduous from rachis when mature.
 Annuals; spikelets densely crowded on rachis; rachilla disarticulating at joints with scales into 1-fruited segments.
 Scales proximate; achenes oblong, superficial cells distinctly hexagonal *C. speciosus*
 Scales distant; achenes linear-oblong; superficial cells faintly reticulate *C. Engelmanni*
 Perennials; spikelets grouped into loose or compact globose or globular heads; two lowest scales persistent.
 Spikelets 2-4 flowered; two lowest scales fruitless *C. ovularis*
 Spikelets 4-10 flowered; two lowest scales fruited *C. filiculmis*

1. PYCREUS, P. Beauv.

Plants annual; leaves basal; culms sheathed; spikelets compressed, clustered on rachis; umbel simple or capitate; rachilla persistent; styles 2-cleft; achenes laterally compressed, lenticular.

Scales scarious.

- Stamens 3. Styles not exserted; achenes black, orbicular, surface cells oblong with distinct transverse wrinkles *C. flavescens*
 Stamens 2. Styles conspicuously exserted; achenes gray, oblong, obovate, surface cells quadrate-hexagonal *C. diandrus*
 Scales coriaceous.
 Stamens 3. Styles slightly exserted; achenes black, obovate, surface cells oblong-hexagonal *C. rivularis*
 Stamens 2 or 3. Styles not exserted; achenes straw-white, oblong-lenticular; surface cells oblong with distinct transverse wrinkles *C. Nieuwlandii*

C. flavescens L. Sp. Pl. 46. 1753.

Fig. 1, map 1.

Annual; culms erect, 4-25 cm. high, leafy at the base, caespitose, slender, smooth; leaves shorter than culms, 1-2 cm. wide, smooth; inflorescence a 2-3 rayed umbel or a sessile cluster of spikelets; rays 2-20 cm. long; 3 unequal involucre leaves subtending the umbels; rachis margined, persistent; spikelets 3-12 in a spreading cluster, linear-oblong, obtuse, 2-2.5 x 5-20 mm., 10-40 flowered; scales ovate, obtuse, 1.5 x 2 mm., membranous, lower ones deciduous when mature; stamens 3; achenes (fig. 19, A.) orbicular-lenticular, 0.75 x

1 mm., black, shining, in section lens shaped, surface cells oblong-hexagonal, distinct transverse wrinkles. Aug.-Oct.

Distribution.—Maine to Michigan, Florida and Mexico. Also in the Old World. In the northwestern, south and middle parts of Indiana. Its habitat is in marshy or boggy places and on the borders of streams, rarely on dry ground.

Published records are for the counties: Clark (Baird and Taylor); Jefferson (Barnes, Coulter's Catalog).

Specimens examined are from the counties: Brown, Carroll, Clark, Dearborn, Gibson, Harrison, Jennings, Kosciusko, Scott (Deam); Jefferson (Barnes, Coulter, Young); Lake (Hill); Lawrence (Wible); Porter, St. Joseph (Nieuwland); Putnam (Grimes, MacDougal).

C. diandrus Torr. Cat. Pl. N.Y. 90. 1819.

Fig. 2, map 2.

Annual; culms erect or decumbent, 5-20 cm. high, green, slender, smooth; leaves slightly longer than the culms, smooth, sheath extending to one-half the length of the culm; umbels of 4-5 rays, 1-3 spikes sessile or subsessile; rays 0.1-3 cm. long; involucre of 3-4 unequal leaves; spikelets 5-15 on common axis, spreading, oblong-lanceolate, acute, flattened, 2.5-3 x 4-15 mm., 8-16 flowered; scales membranous, 2 x 2.5 mm., margins purplish-brown, ovate, obtuse, persistent, sometimes only partially covering the achene; stamens 2; styles 2-cleft, persistent, conspicuously exerted; achenes (fig. 19, C.) oblong-obovate, 0.75 x 1.14 mm., laterally compressed, dull, gray, in section lenticular, surface cells regular hexagonal. Aug.-Oct.

Distribution.—New Brunswick to Ontario, Nebraska and south to South Carolina and Kansas. In Indiana the species is usually found in sandy soil on the borders of lakes or rivers. Some collectors have found it in prairie meadows and in the dried up slough of low river beds.

Published records are for the counties: Clark (Baird and Taylor); Delaware, Jay, Randolph, Wayne (Phinney); Franklin (Meyncke); Fulton (Evermann and Clark); Hamilton (Coulter's Catalog for Wilson); Jefferson (Barnes, Coulter's Catalog for Young); Kosciusko (Clark); Lake, Porter (Fassett); Marshall (Scovell, Clark); Putnam (Coulter's Catalog for MacDougal); Steuben (Bradner); Tippecanoe (Coulter's Catalog for Cunningham); Vigo (Blatchley); Lower Wabash Valley (Schneck).

Specimens examined are from the counties: Bartholomew, Cass, Kosciusko, Newton, Porter, Starke, Whitley (Deam); Jefferson (Coulter); Lake (Sherff); Marshall (Scovell and Clark); Montgomery (Bechtel); Newton (McKee); Porter (Bechtel, Fassett, Greenman, Johnson, Umbach).

C. rivularis Kunth, Enum. 2:6. 1837.

Fig. 3, map 3

Annual; culms erect, 3-25 cm. high, slender tufted, sheathed, leafy at base; leaves narrow, smooth, shorter than culms; umbel of 2-4 rays; rays 0.5-5 cm. long, 1-2 spikes subsessile; 3 involucreal leaves subtending the umbel, two longer and one shorter than the longest ray; spikelets diverging, 3-12 in a cluster, linear-oblong, obtuse, compressed, 2-3 x 3-20 mm., 8-30 flowered;

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scales firm, subcoriaceous, keeled, shining, wide purplish-brown margin or brown all over, green mid-rib, 1.25 x 2 mm.; stamens 2; styles 2-cleft, slightly or not at all exerted; achenes (fig. 19, D.) obovate, 0.75 x 1 mm., laterally flattened, brown, in section lenticular, superficial cells oblong-hexagonal.

Distribution.—Maine to southern Ontario and Michigan, south to Virginia and Missouri. All the specimens examined with the exception of five were collected from the northern part of the state. This species thrives best in low, moist, sandy soil. It has been found near the outlet of springs, in boggy places, and in partially dried up ditches.

Published records are for the counties: Jasper (Welch); Lake (Fassett, Pepoon); Laporte (Fassett); Marion (Smith); Porter (Lyon); Putnam (Wilson); Whitley (Coulter for Deam).

Specimens examined are from the counties: Allen, Bartholomew, Carroll, Cass, Clark, Dekalb, Elkhart, Howard, Jasper, Knox, Kosciusko, Lagrange, Lake, Laporte, Monroe, Montgomery, Noble, Newton, Porter, Posey, Starke, Steuben, Vermillion, Warren, Wells, Whitley (Deam); Bartholomew, Wells (Bartlett); Brown (Anderson); Hamilton (Wilson); Jasper (Welch); Lake (Hill, Lansing, Priem, Umbach, Wright); Montgomery (Bechtel); Porter (Lyon, Nieuwland, Umbach); Putnam (Grimes); St. Joseph (Hebert, Nieuwland); Tippecanoe (Cunningham).

Remarks.—In a recent paper O. A. Farwell referred *C. rivularis* and *C. diandrus* as varieties to *C. flavescens*. Other proposed species prove less distinct than the above mentioned. Therefore *C. rivularis* and *C. diandrus* are given specific rank in accordance with their previous recognition as such.

***C. Nieuwlandii* hybr. nov.**

(*C. flavescens* L. x *C. rivularis* Kunth.)

Fig. 3, B, map 4.

Planta annua radice fibrosa, culmis caespitosis tenuibus, 3-12 cm. altis, basi foliatis; umbella simplex 1-3 radiata, radiis inaequalibus; spiculae subaequilongae, 6-20 mm. longae, 2-2.5 mm. latae, 3-10 laxae in radiolis fasciculato-aggregatae vel fasciculatae subsessiles, 12-40 florum; squamae firmae, toto rubiginosae, carinatae, nitidulae, mox deciduae; stamina 2 vel 3; stylus bifidus; achenium stramineo-albidum, 0.8 x 1.2 mm. oblongo-lenticulare, cellulis hexagonis elongatis, transversim valde muriculatum, plerumque in rhacheola persistens.

Annual; roots fibrous; culms slender, ascending, 3-12 cm. high, leafy at the base, caespitose; inflorescence an umbel of 1-3 unequal rays or a subsessile cluster of spikelets; spikelets 3-10 in a loose spreading cluster, 6-20 mm. long, 2-2.5 mm. wide, 12-40 flowered; scales firm, dark reddish-brown all over, keeled, shining; stamens 2 or 3; style 2-cleft; achene (fig. 19, B.) straw-white, 0.8 x 1.2 mm., oblong-lenticular, surface cells hexagonally elongated, transverse walls heavy, usually persistent on the rachis.

Indiana: Notre Dame, St. Joseph County, October 23, 1912, J. A. Nieuwland. Type specimen in Herbarium of University of Notre Dame, No. 10390.

Remarks.—Three specimens of this plant were found in the Nieuwland collection of the Notre Dame University Herbarium. One was collected near

Chain-Lakes, St. Joseph County, the other two in the vicinity of Notre Dame. Another specimen collected in the same region by J. A. Nieuwland in October 1912, is in the Missouri Botanical Garden Herbarium. The plant resembles *C. rivularis* Kunth., in the character of its scales and the shape of achene, while the surface cells of the nutlet and the manner in which the spikelets are clustered on the axis are similar to *C. flavescens* L. These characters, in connection with its occurrence with typical *C. flavescens* L. and *C. rivularis* Kunth., in two of the cases are reasons for believing it to be a hybrid.

2. EUCYPERUS Benth.

Annuals or perennials; umbel simple or compound; spikelets compressed; rachilla persistent, winged or wingless; scales mucronate; achenes trilateral.

Rachis wingless or narrowly winged.

Annuals; stamen 1.

Scales oblong, awled *C. inflexus*

Scales ovate, apiculate not awled *C. acuminatus*

Perennials.

Stamen 1; scales pale, narrow; achenes linear-oblong *C. pseudovegetus*
Stamens 2 or 3.

Styles exserted; scales reddish-brown on upper surface; achenes
whitish or pale *C. dentatus*

Styles not exserted; scales brown; achenes brown *C. mesochorus*

Culms rough on angles; spikelets ascending, distantly separated on

rachis; achenes 1.2 x 2.5 mm. *C. Schweinitzii*

Culms smooth on angles; spikelets spreading, forming a loose head
at tip of ray; achene 1.5 x 2 mm. *C. Houghtonii*

Rachis winged.

Rootstock tuberous stolon; scales brown, slightly longer than achene *C. esculentus*

Rootstock corm; scales straw color, twice as long as achene *C. strigosus*

C. inflexus Muhl. Desc. Gram. 16. 1817.

Fig. 4, map 5.

Low caespitose annual; culms slender, assurgent or erect, 2-8 cm. high, leafy at the base; leaves narrow, smooth, length of culm; rachis narrowly winged; inflorescence a dense cluster of sessile spikelets or an umbel of 1-3 rays; rays 0.5-2.5 cm. long; involucre leaves 3, usually much longer than the rays; spikelets aggregated into sub-globose heads or clusters, oblong, 2-2.5 x 3-8 cm., 10-16 flowered; scales deciduous, membranous, oblong, 1.5 x 2.5 mm., 5-7 veined, mid-vein green, extending into a long, recurved point; awl 1.5 mm. long; stamen 1; styles 3-cleft; achenes (fig. 20, A.) oblong turbinate, 0.5 x 0.8 mm., light brown, in section triangular, ventrally flattened, surface cells hexagonal, reticular, intraspaces convex. July-Sept.

Distribution.—Vermont to the Northwest Territory and Oregon, south to Florida, Texas, California and Mexico. Specimens of this little plant have been collected and preserved from twenty-three counties of the state of Indiana. Its range is through the northwest and western section. It grows best in moist, sandy or swampy soil. It is commonly found along river banks, sand beaches, sandy roadsides and borders of muddy flats.

Published records are for the counties: Allen, Jefferson (Coulter's Cat-

alog); Clark (Baird and Taylor); Fulton, Lake (Evermann and Clark, Fassett); Jefferson (Barnes, Coulter, J.M. for Young); Laporte (Fassett); Marshall (Clark); Porter (Lyon, Fassett); Putnam (Grimes); White (Heimlich).

Specimens examined are from the counties: Brown (Anderson); Gibson, Greene, Jackson, Knox, Lake, Marshall, Newton, Owen, Parke, Porter, Posey, Vermillion, Vigo, Warren, Wells (Deam); Jefferson (Young); Lake (Hill, Lansing, Ohlendorf, Umbach); Porter (Greenman, Lansing, Lyon, Nieuwland, Umbach); Putnam (Grimes); St. Joseph (Uline); Vigo (Bechtel).

C. pseudovegetus Steud. Syn. Pl. Cyp. 24. 1855.

Fig. 5, map 6.

Stout perennial; culms erect, 50-70 cm. high, smooth, striate; leaves as long as or slightly longer than culms, 8-11 mm. wide, smooth, margins scabrous near apex, keeled, coarsely veined; umbel compound, 6-8 rays; primary rays 3-5 cm. long, secondary rays 1-2 cm. long; involucre of 6-8 very long leaves; involucels about the length of the raylets; spikelets compressed, ovate, grouped into small dense globose heads, 3-4 mm. long, 10-18 flowered; scales 2-2.5 mm. long, narrow, oblong, acute slightly incurving, deciduous; stamen 1; styles 3-cleft; achenes (fig. 20, B.) oblong, $0.3 \times 1.0-1.2$ mm., narrow, apex apiculate, base stalked, in section triangular, dorsal facets slightly convex, ventral facets concave; superficial cells small, faint, hexagonal reticulations, enclosing a small semi-globular papilla. July-Sept.

Distribution.—Delaware to Florida, west to Kansas and Texas. In Indiana this plant has been collected only in Posey County.

One published record is for Posey county (Deam). Three specimens are in the Deam Herbarium.

C. acuminatus Torr. & Hook. Ann. Lyc. N.Y. 3:435. 1836.

Fig. 6, map 7.

Low annual; culms ascending, 3-10 cm. high, slender, smooth, leafy at the base; leaves narrow, mostly overtopping the culm; inflorescence a simple umbel of 1-3 rays, or a sessile cluster of spikelets; rays 0.5-3 cm. long; involucre of 2-3 very long leaves; spikelets oblong-obovate, sub-globose clusters, 3×5 mm., 10-20 flowered; scales ovate, apiculate, pale, 3-nerved, twice as long as the achene; stamen 1; styles 3-cleft; achenes (fig. 20, C.) obovoid, $0.5-1.0$ mm., pale, pointed at top, stipate at the base, in section triangular, superficial cells very faint, irregular, hexagonal reticulations, each enclosing a small papilla. July-Oct.

Distribution.—Illinois to Louisiana, west to Kansas, Oregon and California. In Indiana the species has been found in three counties, somewhat distant from each other.

The published records are for the counties: Crawford and Greene (Deam).

One specimen collected by E. T. Harper in 1888, from Porter county, was examined.

C. dentatus Torr. Fl. U.S. 1:61. 1824.

Fig. 7, map 8.

Perennial; culms erect, 15-35 cm. high, 2mm. wide, rising from a slender scaly rootstock with brownish fibrous roots, striate, smooth, leafy at base; leaves length of culms or shorter, 3-4 mm. wide, coarsely veined, keeled; inflorescence a compound umbel of 4-12 rays, about half the rays elongated and exceeded by the secondary umbels, the remaining rays short, bearing a diverging cluster of spikelets; involucre of 3 unequal leaves, one much longer than the rays; spikelets oblong, acute, compressed, in clusters of 3-5, 10-12 flowered, often abortive; scales about 2 mm. long, width at base 2 mm., apex obtuse, membranous, keeled, mucronate, 3-nerved, reddish at the margins; stamens 3; styles 3-cleft, exserted; achenes (fig. 20, D.) minute, ovate, 0.5-0.8 mm., white, in section triangular, dorsal facets convex, angles rounded; surface cells longitudinal, hexagonal, reticulations delicate, transverse lines coarser than vertical. Aug.-Oct.

Distribution.—Maine to northern New York, south to West Virginia and South Carolina. Its habitat is sandy bottoms and the borders of streams and ditches.

One recorded report is for Clark county by Baird and Taylor.

Specimens examined are from Jasper, Laporte and Starke counties (Deam).

C. dentatus var. *ctenostachys* Fernald, Rhodora 8:126, 1906.

Map 9.

This is a variety with longer spikelets, consisting of 15-40 flowers, tips of scales less prominent.

Distribution.—Same as for the type plant. Indiana specimens were collected in Starke and Jasper counties (Deam, Welch).

Published records are for the counties: Jasper (Welch); Laporte (Benke); Starke (Baird and Taylor, Deam).

Specimens examined are from Laporte county (Benke).

C. Schweinitzii Torr. Ann. Lyc. N. Y. 3:276. 1836.

Fig. 8, map 10.

Perennial; culms erect, 2-7 dm. high, rising from tuberous corms, sharply angled, striate, rough on the edges; leaves keeled, scabrous, about the length of the culm; inflorescence a simple umbel of 2-8 ascending rays, and a central sessile cluster of spikelets; rays 2-11 cm. long; involucral leaves 6, 2 leaves longer and 4 shorter than the rays; spikelets 6-18 loosely clustered, 2.5-5 x 6-18 mm., ascending alternately arranged at end of the rays, oblong, acute, 6-16 flowered; rachilla winged; scales ovate, oblong, acuminate, 3-3.5 x 4-4.5 mm., veins 9-11, keeled, margins translucent, spreading and often exposing the ventral surface of the achene; stamens 3; achenes (fig. 21, A.) ellipsoid, 1.0-1.2 x 2.5-3 mm., dark brown, transvers section triangular, dorsal facets slightly concave; surface cells distinctly hexagonal with a semi-globular papilla in the center, surrounded by a circular ridge. Aug.-Oct.

Distribution.—Western New York and southern Ontario to the Northwest Territory, Minnesota and Kansas. The range of this plant in Indiana

is through six counties in the northwestern section. It is found thriving luxuriously in the Sand Dunes. Some reports have it growing on sandy banks of ditches and creeks, others in open sand areas.

Published records are for the counties: Carroll (Thompson); Lake (Fassett, Highley and Raddin); Laporte (Coulter's Catalog for Barnes, Fassett, Lyon, Pepoon); Newton (Deam); Porter (Fassett, Lyon).

Specimens were examined from the Dune area of Laporte, Lake and Porter counties (Barnes, Chase, Greenman, Heller, Hill, Hebert, Johnson, Lansing, Nieuwland, Olendorf, Priem, Sherff); Lake, Laporte, Warren (Deam); Lake (Umbach); Newton (McKee); St. Joseph (Nieuwland).

C. Houghtonii Torr. Ann. Lyc. N. Y. 3:277. 1836.

Fig. 9, map 11.

Perennial; culms erect, arising from a corm-like base, slender, smooth, 12-40 cm. tall; leaves few, smooth, shorter than culm; inflorescence a simple umbel of 1-4 ascending rays, and a central sessile cluster of spikelets; rays 1-5 cm. long; involucre leaves 3-6; spikelets 4-8, lanceolate-oblong, 7-15 x 2-4 mm., forming a loosely spreading, sub-globose head, flowers 8-16; scales ovate, 2-3 x 1.5-2.5 mm., yellowish-brown, mucronate, 7-9 nerved; achenes (fig. 21, B.) broad-obovoid, 1.5-1.7 x 1.7-2 mm., dark brown, transverse section triangular, surface cells distinctly hexagonal and a definitely outlined central papilla.

Distribution.—West New England to Manitoba and Oregon. South to Virginia, Kansas and Arizona. The habitat of this species is sandy soil. In the state of Indiana the Dune area seems to be the only section from which it has been collected.

Published records are from the counties: Lake (Blatchley, Coulter, S. for Hill, Fassett); Porter (Coulter, S. for Hill, Fassett, Pepoon).

Specimens examined are from Lake (Bebb, Hill, Lansing, Umbach); Porter (Chase, Hill).

C. mesochorus hybr. nov.

(*C. Schweinitzii* Torr. x *C. Houghtonii* Torr.)

Fig. 10, map 12.

Perennis; culmus 1-6 dm. altus e basi cormosa ortus in quasibulum incrassatus, striatus scabriusculus vel laevis; folia numerosa marginibus scabriusculis vel laevibus culmum aequantia; umbella simplex radii 1-7 inaequalibus 2-10 cm. longis, spica centrali sessili; bractae 4-8 duo radios valde superantes; spiculae 4-20 spicas subglobosas laxas vel compactas subdensas formantes; squamae ovatae 3-4 mm. longae 2-2.5 mm. latae mucronatae marginibus albo-hyalinae translucens, 9-11-venosae; stamina 3; achenium 1.5-2.3 mm. longum, 1-1.5 mm. latum, ellipsoideum, brunneum, triangulare, cellulis hexagonis papillis semiglobosis interjectis.

Perennial; culms 1.6 dm. high rising from tuberous corms, sharply angled, striate, rough or smooth; leaves many, margins rough or smooth, length of culms; inflorescence a simple umbel of 1-7 unequal rays, a sessile cluster of spikelets in the center; involucre leaves 4-8, 2 leaves much longer than

rays; rays 2-10 cm. long; spikelets 4-20 forming a loose to compact sub-globose head; scales ovate 2-2.5 x 3.4 mm., mucronate, margins translucent, 9-11 veined; stamens 3; achenes (fig. 24, C.) 1.0-1.5 x 1.5-2.3 mm., ellipsoidal, brown, in section triangular; superficial cells hexagonal, walls enclosing a semi-globular papilla.

Specimens examined are from the counties: Lake (Bebb, Deam, Greenman, Hill, Sherff, Umbach); Porter (Churchill, Deam, Hill, Lansing, Lyon, Nieuwland, Olendorf).

Remarks.—While studying the specimens of *C. Schweinitzii* Torr. and *C. Houghtonii* Torr. a group of plants was found that could not be classified as true forms of either of the above species.

A comparative study of the specimens of the three forms indicates that the questionable form is an intermediate between the two typical species. These data and a consideration of distribution and habit have lead to the description of a new hybrid.

	<i>C. mesochorus</i>	<i>C. Schweinitzii</i>	<i>C. Houghtonii</i>
Underground parts	Tuberous corms	Tuberous corms	Tuberous corms
Culms	1. angled mostly sharp 2. some rough others smooth 3. length 1-6 dm.	1. sharply angled 2. rough 3. length 2-7 dm.	1. obtusely angled 2. smooth 3. length 1.5 to 3.5 dm.
Leaves	1. some rough others smooth 2. many, length of culm 3. inv. leaves 4-8	1. rough 2. about length of culm 3. inv. leaves 6	1. smooth, few 2. length 9-12 cm. much shorter than culm 3. inv. leaves 3-5
Rays	1. No. 1-7 2. length 2-10 cm. 3. inv. leaves 4-5-8 4. some margins smooth others rough	1. No. 2-8 2. length 2-11 cm. 3. inv. leaves 6 2 longer 4 shorter than rays	1. No. 2-4 2. length 2-6 cm. 3. inv. leaves 3 to 5 4. smooth margins
Spikelets	1. No. 5-20 2. length 5-20 mm. 3. width 2-4 mm. 4. flowers 4-17	1. No. 6-18 2. length 6-18 mm. 3. width 2.5-5 4. flowers 6-16	1. No. 5-7 2. length 5-12 mm. 3. width 3 mm. 4. flowers 5-9
Scales	1. veins 9-11 mostly 11 2. mucronate 3. length 3-4 mm.	1. veins 9-11	1. veins 9 2. length 2-2.5 mm. 3. width 2 mm.
Achenes	1. width 1-1.5 mm. 2. length 1.5-2.25	1. width 1-1.2 mm. 2. length 2.5-3 mm.	1. width 1.25-1.5 mm. 2. length 1.5-2 mm.

C. esculentus L. Sp. Pl. 45. 1753.

Fig. 11, map 13

Perennial; roots fine, fibrous; rootstock extensively creeping; culms 2.5-7 cm. high, stout, rigid, striate; leaves many, ascending from the base, length of culms, 4-7 mm. wide, keeled, smooth; inflorescence a compound umbel of 6-8 rays, erect or ascending; rays 1-8 cm. long; involucre of 3-6 leaves, two leaves much longer than the rays, margins rough; rachis and rachilla winged, both persistent; spikelets 8-10, spreading, 8-15 cm. long, 1.2-1.5 mm. wide, oblong-linear, acute, flattened, 6-18 flowered, many flowers sterile; scales ovate, 7-9 strongly nerved, golden-brown or fuscous, mucronate, margins hyaline; stamens 3; styles 3-cleft; achenes (fig. 22, A.) oblong-obovoid, 0.7 x 1.5 mm., shining, light brown, in section triangular with concave ventral side and rounded angles, surface cells hexagonal, appearing somewhat inflated due to air cavities in the cells overlying the hard endocarp. Aug.-Oct.

Distribution.—New Brunswick to Minnesota, south to Florida and Texas. Also on the Pacific Coast from California to Alaska, in tropical America and widely distributed in the Old World. Most of the specimens in Indiana were collected from the southern part of the state. It grows best in moist places, as low ground in corn fields, moist roadsides, the borders of marshes. One specimen was taken from a dried up pond located in Vigo county. The plant was so abundant that the pond was a solid mass of the species. It usually becomes a very undesirable weed.

Published records are for the counties: Franklin (Meyncke); Hamilton (Grimes); Jefferson (Barnes, Coulter, J.M. for Young); Lake (Fassett, Higley and Raddin); Laporte (Fassett); Lower Wabash Valley (Schneck).

Specimens examined are from the counties: Clay, Crawford, Dearborn, Dubois, Greene, Jackson, Montgomery, Morgan, Ohio, Owen, Perry, Pike, Posey, Switzerland, Starke, Sullivan, Vermillion, Vigo, Wells (Deam); Benton (Berce); Hamilton (Wilson); Jefferson (Coulter); Lawrence (Wible); Montgomery (Bechtel and Welch); Putnam (MacDougal); St. Joseph (Slavin).

C. esculentus var. *macrostachyus* Boeckl. Linnaea 36:291, 1870.

Map 14.

This variety is more sturdy than the typical plant and differs in the character of its spikelets and the size of the achene. The spikelets are golden-brown, 15-30 flowered. Scale tips are mucronate and spreading.

Distribution.—The same as for *C. esculentus* L.

Specimens examined are from the counties: Dearborn, Jennings, Monroe, Perry, Porter, Scott, Wells (Deam).

C. strigosus L. Sp. Pl. 47. 1753.

Fig. 12, map 15.

Perennial, with corm-like tubers, straw colored to golden-yellow; culms stout, 1.5-7 dm. high, erect, smooth; leaves 3-5 arising from base, about the length of the culm, 3-7 mm. wide; inflorescence a simple or compound umbel

of 6-14 unequal rays; rays 0.5-1.5 cm. long; involucre leaves 6-9, 3-50 cm. long, 5-7 mm. wide; spikelets few-to-many, spreading horizontally, clustered on the axis, 1.5-2 x 6-15 mm., oblong, acute, flattened, 6-18 flowered, deciduous; scales oblong-lanceolate, 3.5-4 mm. long, rigid, mucronate, 7-9 well defined nerves, mid-vein green, margin narrowly translucent; rachilla hyaline, winged; stamens 3; styles 3-cleft, slightly exserted; achenes (fig. 22, B.) linear-oblong, 0.3 x 1.5-1.8 mm., shining, light brown, in cross section triangular, superficial cells hexagonal reticulations, the enclosed space containing a circular pit with a distinctly raised margin. Aug.-Oct.

Distribution.—Maine and Ontario to Minnesota, south to Florida and Texas. This is the best represented species in the state of Indiana. Its distribution includes the entire state. Specimens have been collected from sixty-one counties. It adapts itself to both dry and moist conditions of the soil. It has been found in sandy and pasture fields, in hard clay soil along roadsides, on moist sandy roadsides, in swamps and marshes, near the outlet of springs, in dry creek bottoms and on open hillsides.

Published records are for the counties: Daviess (Coulter, S. for Clements); Clark (Smith); Delaware, Jay, Randolph, Wayne (Phinney); Franklin (Meyncke); Fulton (Evermann and Clark); Hamilton (Grimes, Wilson); Jefferson (Barnes, Coulter, J. M. for Young); Kosciusko (Clark, Chipma); Lake and Laporte (Fassett); Marion (Wilson); Marshall (Clark); Monroe (Welch); Noble (Van Gorder); Porter (Fassett, Lyon); Putnam (Grimes, Coulter's Catalog for MacDougal); Steuben (Bradner); Tippecanoe (Coulter's Catalog for Cunningham); Vigo (Blatchley); White (Heimlich); Lower Wabash Valley (Schneck).

Specimens examined are from the counties: Allen, Blackford, Brown, Cass, Clarke, Clay, Daviess, Dekalb, Delaware, Dubois, Elkhart, Fayette, Fulton, Gibson, Greene, Harrison, Henry, Jackson, Jasper, Jefferson, Jennings, Knox, Kosciusko, Lagrange, Lake, Laporte, Lawrence, Marshall, Martin, Montgomery, Morgan, Newton, Noble, Orange, Owen, Parke, Pike, Porter, Posey, Pulaski, Ripley, Rush, St. Joseph, Scott, Spencer, Steuben, Sullivan, Union, Vermillion, Vigo, Wabash, Warren, Wayne, Wells, White, Whitley (Deam); Daviess (Clemens); Fulton (Umbach); Hancock, Morgan (Mrs. Deam); Jefferson (Barnes); Knox (Schneck); Lake (Umbach, Wright); Marion (Hitchcock, White); Monroe (Welch and Price); Montgomery (Bechtel); Newtotn (McKee); Porter (Fassett, Lansing, Lyon, Umbach); Putnam (Grimes); St. Joseph (Nieuwland, Herbert); Steuben (Peattie); Tippecanoe (Cunningham).

C. strigosus var. *robustior* Kunth, Enum. 2: 88, 1837.

Map 16.

This variety differs from typical *C. strigosus* in being extraordinarily large and sturdy. The umbels are compound, rays long and widely spreading, length of spikelets 1.2-2.5 cm., flowers 12-20.

Distribution.—The same as for *C. strigosus*. It has been found growing in low woodlands, bogs and moist soil.

The published record is by Fassett for Porter county.

Specimens examined are from the counties: Jennings, Knox, Pulaski, Scott, Warrick (Deam); Marshall (Churchill); Porter (Fassett).

C. strigosus var. **multiflorus** var. nov.

Fig. 13, map 17.

Perennis; culmus erectus e basi subincrassata (cormosa) ortus 2.5-15 cm. altus laevis; folia culmo aequilonga vel breviora 1.5-3 mm. lata laevia; umbella 3-6 radiata radiis 0.5-3 cm. longis bracteis 3-6, 5-17 cm. longis 1-4 mm. latis; spiculae 10-40 late patentis in rhachilla laxae dispositae 11-38 mm. longae 1-1.5 mm. latae oblongae acutae compressae, deciduae, 10-35 florum; squamae oblongo-lanceolatae 4 mm. longae 1.5 mm. latae fusco-purpureae e carina viridi mucronatae obsolete 3-5 nervosae; stamina 3; achenium $\frac{1}{2}$ squamae aequans, 2 mm. longum, 0.75 mm. latum, cellulis hexagonis regulariter reticulatum.

Perennial; culms erect, arising from a small corm-like base, 2.5-15 cm. high, smooth; leaves length of culm or shorter, 1.5-3 mm. wide, smooth; inflorescence umbel of 3-6 rays; rays 0.5-3 cm. long; 3-6 involucre leaves subtending umbel, 5-17 cm. long, 1.4 mm. wide; spikelets 10-40, widely spreading, loosely clustered on axis, 11-38 x 1-1.5 mm., oblong, acute, flattened, deciduous, flowers 10-35; scales oblong-lanceolate, mucronate, 1.5 x 4 mm., reddish-brown, 3-5 faint veins, mid-vein green; stamens 3; achenes (fig. 25) 0.75 x 2 mm., $\frac{1}{2}$ length of scales, surface cells reticulate, regular hexagonal.

Distribution.—Several specimens of this plant were collected by C. C. Deam from Cass and St. Joseph counties in September and October of 1931. The fruits of these plants were very immature. Another collection of the same form from Cass County was made in October 1932. Although the fruits from the latter specimens were more developed so that their structure could be determined they were not mature.

In character the plant resembles *C. strigosus* L. It is a dwarf form with numerous horizontally spreading spikelets. The spikelets bear from 10-35 flowers.

3. *MARISCUS* Vahl

Perennials; culms tuberous at base; inflorescence a simple umbel or capitate; spikelets in compact globular heads, sessile or on rays, deciduous; stamens 3; achenes triangular.

Spikelets collected into dense ovate heads, 2-4 flowered, deciduous.

Two lower scales of spikelets empty, persisting.

Achene obovate, surface cells hexagonal, horizontally elongated.....*C. ovularis*. Spikelets collected into loose globose heads, 4-10 flowered, deciduous.

Two lower scales of spikelets not empty, persisting.

Achene oval, surface cells hexagonal, pitted.....*C. filiculmis*.

C. ovularis Michx. Torr. Ann. Lyc. N.Y. 3:278. 1836.

Fig. 14, map 18.

Perennial; culms erect, tuberous at the base, 0.5-7 dm. high, 1-2 mm. wide, triangular, smooth; leaves basal, sheaths extending but a short distance,

shorter than culm, 3-5 mm. wide, scabrous on margin; involucre 5-6 unequal leaves which alternate with the rays; rachis joints winged; inflorescence a simple umbel of 5-6 short rays; rays 0.5-4 cm. long; spikelets terete, 4-5 mm. long, 2-3 flowered, aggregated into dense globose heads, deciduous, separating at a point above the two lower scales, the latter persisting on the axis giving it a chaffy appearance; scales appressed, 9 nerved, mucronate; stamens 3; styles 3-parted; achenes (fig. 22, C.) obovate-oblong, 0.5-0.7 x 1.8-2 mm., in section flatly triangular, the margins of ventral angles round, dorsal facets slightly concave; surface cells faintly reticulate, laterally elongated hexagonal cells, the inner space slightly papillate and a small pit in the center. July-Sept.

Distribution.—Southern New York to Florida, west to Illinois, Kansas and Texas. The Indiana specimens were collected principally from the southwest part of the state. It is generally found in very dry, sandy soil along roadsides, in open woodlands, pasture fields and truckpatches.

Published records are for the counties: Gibson (Coulter's Catalog); Jefferson (Barnes, Coulter, J. M. for Young); Lake (Coulter, Fassett, Higley and Raddin, Hill, Pepoon); Lower Wabash Valley (Schenck).

Specimens examined are from Crawford, Daviess, Knox, and Spencer counties (Deam).

C. filiculmis Vahl, Enum. ii:328. 1806.

Fig. 15, map 19.

Perennial; culms slender, 1-6 dm. high, smooth, arising from a corm; leaves linear, very narrow, shorter than the culm; inflorescence of dense sessile heads, or an umbel of 1-3 irregular rays surmounted by a globose head; leaves of involucre 3-7, 2 leaves are usually much longer than the others, roughened on the margins; rachilla not winged; spikelets oblong, acute, 5-8 mm., 8-14 flowered; scales ovate, 2-2.5 mm. long, mucronate, 5-nerved, mid-vein green; stamens 3; styles 3-cleft; achenes (fig. 22, D.) oblong-obovate, 1.8-2 mm. long, grayish-brown, transvers section triangular; superficial cells hexagonal, a large circular pit with raised margins in the center. June-Aug.

Distribution.—Rhode Island to Ontario and Minnesota, south to Florida, Kansas, Texas and northern Mexico. It is well distributed through the northern, western and southwestern part of Indiana. Its habitat is in very dry sandy soil. Specimens have been collected from sandy fields and roadsides, extinct lakes and dry sandy river banks, sand dunes and sandy soil waste places.

Published records are for the counties: Knox (Deam); Kosciusko, Marshall (Clark); Lake (Blatchley, Coulter's Catalog, Fassett); Laporte (Coulter, Fassett); Porter (Coulter's Catalog, Fassett, Lyon); Lower Wabash Valley (Schneck).

Specimens examined are from the counties: Cass (Deam); Gibson (Schneck); Lake (Hill, Lansing, Millspough, Umbach, Wright); Laporte (Coulter); Marshall (Clark, Scovell); Porter (Fassett, Lansing, Lyon, Umbach, Wolcott); St. Joseph (Uline).

C. filiculmis var. *macilentus* Fernald, Rhodora 8:128, 1906.

Map 20.

In this form the umbel is usually capitate; spikelets shorter, 4-8 flowered; achene 1.5-1.7 mm. long. The range and habit is similar to the type species.

Published records are for the counties: Jasper (Welch); Porter (Fassett, Lyon, Pepon).

Specimens examined are from the counties: Allen, Clark, Daviess, Fulton, Gibson, Jasper, Knox, Kosciusko, Lagrange, Lake, Laporte, Marshall, Newton, Noble, Porter, Posey, St. Joseph, Starke, Steuben, Sullivan, Tippecanoe, Vigo, Warren (Deam); Fulton (Umbach); Jasper (Welch); Lake (Moffatt, Umbach); Newton (McKee); Porter (Chase, Lyon, Nieuwland, Umbach, Wright); St. Joseph (Hebert, Nieuwland); Steuben (Churchill).

4. DICLIDIUM Schrad.

Plants annual; roots fibrous; umbels compound; spikelets terete or subterete, numerous, densely crowded on the rachis; rachilla winged, margins embracing achene, disarticulating at joints into 1-fruited segments.

Spikelets crowded on axis, 6-20 flowered.

Rachilla broadly winged with extending joints.

Scales close together *C. speciosus*.

Spikelets densely crowded on axis, 4-12 flowered.

Rachilla narrowly winged with flexuous joints.

Scales far apart *C. Engelmanni*.

C. speciosus Vahl, Enum. ii:304. 1806.

Fig. 16, map 21.

Annual; culms erect, 3-40 cm. high, stout, smooth, very leafy at the base; leaves shorter or longer than culm, 1-5 mm. wide, roughened on margins; inflorescence a compound umbel of 4-9 rays; leaves of involucre 5-7, longer than the rays; spikelets densely crowded along the axis of the rachis, forming a spreading cylindrical spike, sub-terete, linear, acute, 1.2-1.4 x 1.7-2.5 mm., flowers 6-20; scales oblong-obovate, 0.8-1 x 2-2.5 mm., from light straw-brown to dark reddish-brown, mucronate, 5-7 faintly nerved, mid-vein green; rachilla broadly winged, clasping the achene, easily breaking into segments at each articulation with the scale; stamens 3; styles 3-parted; achenes (fig. 24, A.) oblong, 0.5-0.7 x 1.2-1.5 mm., light grayish-brown, in transverse section triangular, compressed, outer angle obtuse, dorsal facets convex, ventral facet plane, surface cells distinctly hexagonal, center pitted.

Distribution.—Rhode Island to Ohio and Minnesota, south to Florida, Texas and California. Found throughout Indiana, particularly in the Dune region. Reports indicate that it grows best in sandy and moist ground, along streams and muddy or sandy lake borders.

Published records are for the counties: Jasper (Welch); Jefferson (Barnes, Coulter, J. M. for Young); Lake (Fassett); Vigo (Blatchley); White (Heimlich).

Specimens examined are from the counties: Adams, Allen, Carroll, Cass, Daviess, Dearborn, Delaware, Gibson, Grant, Jackson, Jennings, Knox, Kosciusko, Lake, Monroe, Montgomery, Ohio, Starke, Steuben, Sullivan,

St. Joseph, Union, Vermillion, Vigo, Warren, Whitley (Deam); Hamilton (Grimes); Jefferson, Lake, Porter (Umbach); Lake (Hill); Porter, St. Joseph (Nieuwland and Just).

C. Engelmanni Steud. Syn. Pl. Cyp. 47. 1855.

Fig. 17, map 22.

Annual; culms erect, 1.5-30 cm. high, striate, smooth, sheathed about half their length; basal leaves, mostly length of culms; inflorescence a compound umbel of 3-5 rays; 3-5 very long involuclral leaves subtending umbel, margins rough; spikelets narrowly linear, terete, 1-1.5 x 6-14 mm., densely crowded on all sides of axis, ascending or spreading horizontally, 4-12 flowered; scales oblong, obtuse, 1.0-1.5 x 3.0-20 mm., membranous, greenish and faintly nerved on back, reddish-brown and glossy on sides, alternately arranged on rachilla in such a manner that the lower scale reaches to half the length of the preceding giving the spikelets a zigzag appearance, apex of scale exserted; rachilla wing broad closing the entire achene and breaking up into 1-fruited segments; achenes (fig. 23) linear-oblong, 0.5-6 x 1.5-1.7 mm., in section triangular; surface cells faintly reticulate, a small central papilla in each.

Distribution.—Massachusetts to southern Ontario and Wisconsin, south to New Jersey and Missouri. The Indiana range for the plant is restricted. It has been found in the northeastern part of the state, on moist sandy shores of lakes and in dried up mud and marl lake borders.

Published records are for the counties: Lake (Coulter, Fassett, Higley and Raddin, Pepon); Laporte (Coulter, Deam, Higley and Raddin); Porter (Hill); Whitley (Coulter, S. for Deam).

Specimens examined are from the counties: Cass, Marshall, Noble, St. Joseph, Wells, Whitley (Deam); Lake, Porter (Hill); Porter (Lansing).

5. *PAPYRUS* Willd.

Annual; umbel compound; spikelets densely clustered on rachis, many flowered; rachis winged; scales deciduous, after falling leave two persistent interior scales; stamens 3; styles 3-cleft; achenes triangular.

C. erythrorhizos is the only species belonging to the sub-genus *Papyrus* that has been found in Indiana.

C. erythrorhizos Muhl. Desc. Gram. 20. 1817.

Fig. 18, map 23.

Annual; roots fibrous, reddish; culms stout, 0.2-6 dm. high, smooth; leaves shorter than culms, rough on margins; inflorescence a compound umbel, primary rays 4-10, secondary rays usually 4; involuclral leaves 4-8, longer than the rays; involuclres setaceous; spikelets numerous, oblong-linear, acute, 1-1.5 x 4-10 mm., spreading horizontally, 12-40 flowered; scales ovoid-oblong, golden-brown, shining, mucronate, 5-nerved, mid-vein green, deciduous at maturity, leaving 2 persistent interior scales attached to the rachilla; stamens 3; styles 2-parted; achenes (fig. 24, B.) broadly-oval, flattened on ventral surface, 0.5-0.8 mm., light brownish-yellow, glossy, in section triangular,

dorsal facets convex, ventral facets slightly concave; surface cells distinctly hexagonal. Aug.-Oct.

Distribution.—Southern Ontario to Massachusetts and Florida, west to Missouri, Texas and California. The Indiana specimens are from twenty-two counties. It is usually found in low swampy places, and the dried up shores of ponds and muddy river banks.

Published records are for the counties: Hamilton (Coulter's Catalog for Wilson); Jefferson (Barnes); Lake (Fassett); Laporte (Fassett, Editors of Bot. Gaz., Pepon); Putnam (Coulter's Catalog for MacDougal); Steuben (Bradner); Lower Wabash Valley (Schneck).

Specimens examined are from the counties: Daviess, Gibson, Greene, Jackson, Jasper, Knox, Laporte, Monroe, Perry, Porter, Posey, Spencer, Starke, Warrick, Wells (Deam); Jefferson (Coulter); Lake (Deam, Hill, Moffatt, Umbach); Newton (McKee); Porter (Hill, Lansing); St. Joseph (Nieuwland).

Excluded Species

The following species have been reported by collectors but are not included in the paper due to insufficient data.

- C. microdontus* Torr., reported for Carroll County by Thompson.
- C. flavicomus* Michx., reported for Jefferson County by Barnes; J. M. Coulter for A. H. Young.
- C. strigosus* var. *compositus* Britton, reported for Monroe County by Price and Welch.
- C. strigosus* var. *capitatus* Boeckl., reported for Floyd County by Britton for Clapp.

Specimens for the following have been examined but neither collector nor location was given. Wabash College:

- C. erythrorhizos*—one specimen,
- C. speciosus* Vahl.—two specimens,
- C. strigosus* L.—five specimens,
- C. esculentus* L.—one specimen.

From the distribution maps of Butler University the following have been excluded:

- C. compressus* L.—one specimen for Jasper County,
- C. hystricinus* Fernald—one specimen for Jasper County,
- C. esculentus* var. *leptostachys* Boeckl.—one specimen for Monroe County,
- C. strigosus* var. *compositus* Britton—two specimens for Monroe County.

Three doubtful *C. mesochorus* specimens collected by Chas. Deam from Laporte, Newton and Warren counties.

One doubtful specimen of *C. Bushii* Britton collected by Madge McKee from Newton County.

BIBLIOGRAPHY

- ABRAMS, LEROY. 1923—An illustrated flora of the Pacific States. vol. 1, pp. 255-261.
- BAIRD, J. F. AND J. L. TAYLOR. 1878—The flora of Clark County, Indiana. Manual of the public schools of Clark County, Indiana for 1878-79, pp. 45-65.
- BENTHAM, G. AND J. D. HOOKER. 1883—Genera Plantarum, vol. 3, part ii, pp. 1043-1045.
- BLATCHLEY, W. S. 1897—Notes on some phanerogams, new or rare to the State. Proc. Indiana Acad. Sci. 1896, pp. 130-143.
- 1897—A catalogue of the uncultivated ferns and flowering plants of Vigo County, Indiana. Indiana Geol. Rept. 21, pp. 577-708, map.
- 1898—Notes on the flora of Lake and Porter Counties, Indiana. Indiana Geol. Rept. vol. 22, pp. 92-102.
- BOECKELER, OTTO. 1868—Die Cyperaceen des Königlichen Herbariums zu Berlin. Linnaea, vol. 35, pp. 397-612.
- 1870—Die Cyperaceen des Königlichen Herbariums zu Berlin. Linnaea, vol. 36, pp. 271-512.
- EDITORS OF BOTANICAL GAZETTE AND CHARLES R. BARNES. 1881—Flora of Indiana. Catalogue of the phaenogamous and vascular cryptogamous plants of Indiana. p. 33.
- BRADNER, E. 1892.—A partial catalogue of the flora of Steuben County, Indiana. Geol. Rept. vol. 17, pp. 135-139.
- BRITTON, N. L. 1886—A preliminary list of North American Species of Cyperus, with descriptions of new forms. Bull. Torr. Bot. Club, vol. 13, pp. 205-206.
- BRITTON, N. L. AND R. BROWN. 1913—Illustrated flora of the Northern States, Canada, and the British Possessions. ed. 2, vol. 1, pp. 297-310.
- CHAPMAN, A. W. 1860—Flora of the southern United States. pp. 505-512.
- CLARKE, C. B. 1883—"Cyperus," pp. 279-296, in BAKER, J. G.: "Contributions to the flora of Madagascar"—Part III. Incompletae, Monocotyledons, and Filices, Journ. Linn. Soc. London. Bot., vol. 20, no. 127, pp. 237-304.
- CLARK, H. WALTON. 1902—Flora of Eagle Lake and vicinity. Proc. Indiana Acad. Sci. 1901, pp. 128-192.
- 1920—The flora of Lake Maxinkuckee and vicinity. Lake Maxinkuckee, a physical and biological survey by Evermann and Clark, vol. 2, pp. 117-447. (Cyperus: pp. 240-241).
- COOK, MEL T. 1902—The vegetation of abandoned rock quarries. Proc. Indiana Acad. Sci. 1901, pp. 266-272.
- COULTER, JOHN M. 1876—Some plants new to the flora of Jefferson County, Indiana. Bot. Bull. June, vol. 1, pp. 34-35. July, vol. 1, p. 38.
- 1917—A century of Botany in Indiana. Proc. Indiana Acad. Sci. 1916, pp. 236-260.
- COULTER, J. M., COULTER, S., AND BARNES, C. R. 1882—Catalogue of the phaenogamous and vascular cryptogamous plants of Indiana. Supplement. Crawfordsville.

- COULTER, STANLEY. 1896—A report upon certain collections of phaenogamous presented to the State Biological Survey. *Proc. Indiana Acad. Sci.*, 1895, pp. 169-182.
- 1900—A catalogue of the flowering plants and of the ferns and their allies indigenous to Indiana. *Indiana Geol. Rept.* 1899, pp. 553-1074.
- 1900a—Contributions to the flora of Indiana. VI. *Proc. Indiana Acad. Sci.* 1899, pp. 104-112.
- DEAM, CHAS. C. 1917—Plants new or rare to Indiana. VII. *Proc. Indiana Acad. Sci.* 1916, pp. 315-322.
- 1921—Plants new to Indiana. IX. *Proc. Indiana Acad. Sci.* 1920, pp. 225-228.
- 1923—Plants new to Indiana, XI. *Proc. Indiana Acad. Sci.* 1922, pp. 263-264.
- 1925—Flora of Indiana; on the distribution of the ferns, fern allies, and flowering plants. *Proc. Indiana Acad. Sci.* 1924, pp. 39-53.
- ENDLICHER, ST. 1836-1840—*Genera Plantarum*. Vienna.
- ERLANSO, EILEEN WHITEHEAD. 1924—List of Indiana plants, chiefly from Putnam County, collected 1910-1915 by Earl J. Grimes. *Proc. Indiana Acad. Sci.* 1923, vol. 33, pp. 123-162.
- EVERMANN, BARTON W. AND H. WALTON CLARK. 1910—Fletcher Lake, Indiana, and its flora and fauna. *Proc. Wash. Biol. Soc.*, vol. 23, pp. 81-88.
- FARWELL, OLIVER ATKINS. 1930—Botanical Gleanings in Michigan, VI. *Amer. Mid. Nat.*, vol. 12, p. 118.
- FASSETT, NORMAN C. 1930—"Cyperaceae" in PEATTIE, D.C. *Flora of the Indiana Dunes*, pp. 76-78.
- FERNALD, M. L. 1906—Some new or little known Cyperaceae of Eastern North America. *Rhodora*, vol. 8, pp. 126-130.
- 1918—The geographic affinities of the vascular floras of New England, the Maritime Provinces and Newfoundland. *Amer. Jour. Bot.*, vol. 5, pp. 219-236, pls. 3.
- GRIMES, EARL J. 1912—New and notable members of the Indiana flora. *Proc. Indiana Acad. Sci.* 1911, p. 286.
- HEIMLICH, LOUIS F. 1922—Plants of White County, IV. *Proc. Indiana Acad. Sci.* 1921, p. 117.
- 1923—Plants of White County, V. *Proc. Indiana Acad. Sci.* 1922, pp. 281-289.
- HIGLEY, WILLIAM K. AND CHARLES S. RADDIN. 1891—The flora of Cook County, Indiana. *Bull. Chicago Acad. Sci.*, vol. 2, pp. 125-126.
- KUNTH, CARL SIGISMUND. 1837—*Enumeratio Plantarum*. *Cyperographia*, vol. ii, pp. 1-127.
- LYON, MARCUS WARD, JR. 1927—List of flowering plants and ferns in the Dunes State Park and vicinity, Porter County, Indiana. *Amer. Mid. Nat.*, vol. 10, p. 257.
- 1930—List of flowering plants and ferns in the Dunes State Park and vicinity, Porter County, Indiana. *Supp. Amer. Mid. Nat.*, vol. 12, no. 2, p. 37.

- MEYNCKE, O. M. 1885—The flora of Franklin County, Indiana. Bull. Brookville Soc. Nat. Hist., vol. 1, pp. 13-38.
- 1886—The flora of Franklin County, Indiana. Bull. Brookville Soc. Nat. Hist., vol. 2, pp. 45-49.
- MILLSPAUGH, CHARLES F. AND AGNES CHASE. 1903—Plantae Yucatanæ. Fasc. I. Gramineæ and Cyperaceæ. Field Columbian Museum. Pub. 69. Bot. Ser., vol. 3, no. 1, pp. 67-77.
- PEPOON, H. S. 1927—An annotated flora of the Chicago area, pp. 193-194.
- PHINNEY, A. J. 1883—Flora of central-eastern Indiana. Indiana Geol. Rept., vol. 12, pp. 193-243.
- POST, VON TOM AND OTTO KUNTZE. 1904—Lexicon Generum Phanerogamarum, p. 159.
- PRICE, GLADYS AND WINONA H. WELCH. 1929—Enumeration of the vascular flora of a limestone area of the Bloomington Quadrangle, Monroe County, Indiana. Proc. Indiana Acad. Sci., vol. 39, p. 127.
- ROBINSON, BENJAMIN L. AND MERRITT L. FERNALD. 1908—Gray's new manual of Botany, ed. 7, pp. 172-179.
- SCHNECK, J. 1876—Catalogue of the flora of the Wabash Valley below the mouth of the White River. Indiana Geol. Rept., vol. 7, pp. 504-579.
- SCOVELL, J. T. 1901—The flora of Lake Maxinkuckee. Proc. Indiana Acad. Sci. 1900, pp. 124-131.
- SMITH, CHAS. PIPER. 1906—Notes upon some little known members of the Indiana Flora. Proc. Indiana Acad. Sci. 1905, pp. 155-158.
- THOMPSON, M. 1892—Geological and Natural History report of Carroll County, Indiana. Indiana Geol. Rept., vol. 17, pp. 171-191.
- TORREY, JOHN. 1836—Monograph of North American Cyperaceæ. Ann. Lyc. Nat. Hist. of N. Y., vol. 3, pp. 249-282.
- VAHL, MARTIN. 1806—Enumeratio Plantarum, vol. 2.
- VAN GORDER, W. B. 1885—Catalogue of the flora of Noble County, Indiana, Kendallville, Indiana, p. 52.
- 1893—Flora of Noble County, Indiana. Indiana Geol. Rept., vol. 18, pp. 33-71.
- WELCH, WINONA H. 1926—An ecological study of the flora of Fountain Park and portions of the adjacent territory, Jasper County, Indiana. Proc. Indiana Acad. Sci. 1925, vol. 35, pp. 201-212.
- 1927—Enumeration of the vascular flora of Jasper County, Indiana. Proc. Indiana Acad. Sci. 1926, vol. 36, pp. 213-220.
- 1929—A contribution to the phytocology of southern Indiana with special reference to certain Ericaceæ in a limestone area of the Bloomington quadrangle. Proc. Indiana Acad. Sci. 1928, vol. 38, pp. 65-83.
- 1931—Additions to the vascular flora of Jasper County, Indiana. Proc. Indiana Acad. Sci., vol. 40, pp. 119-121.
- WILSON, GUY. 1895—Flora of Hamilton and Marion Counties, Indiana. Proc. Indiana Acad. Sci. 1894, pp. 156-176.
- 1906—Notes on some new or little-known members of the Indiana flora. Proc. Indiana Acad. Sci. 1905, pp. 165-175.
- NOTRE DAME COLLEGE,
SOUTH EUCLID, OHIO.

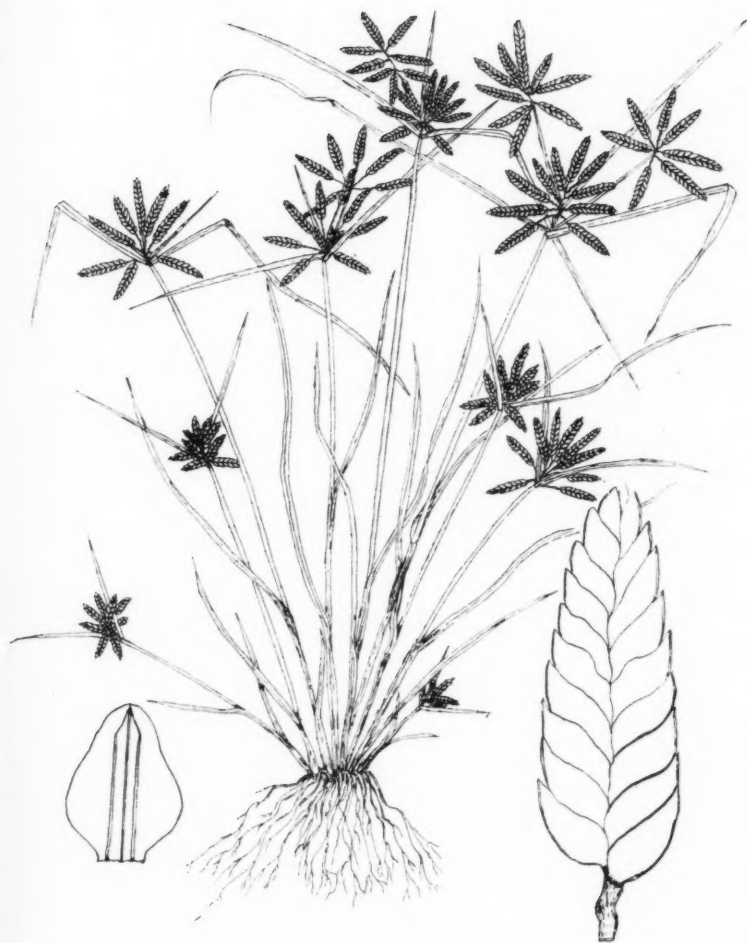


Fig. 1. *C. flavescent* L. Habit-drawing reduced 1/5; spikelet x 6; scale x 7.5.

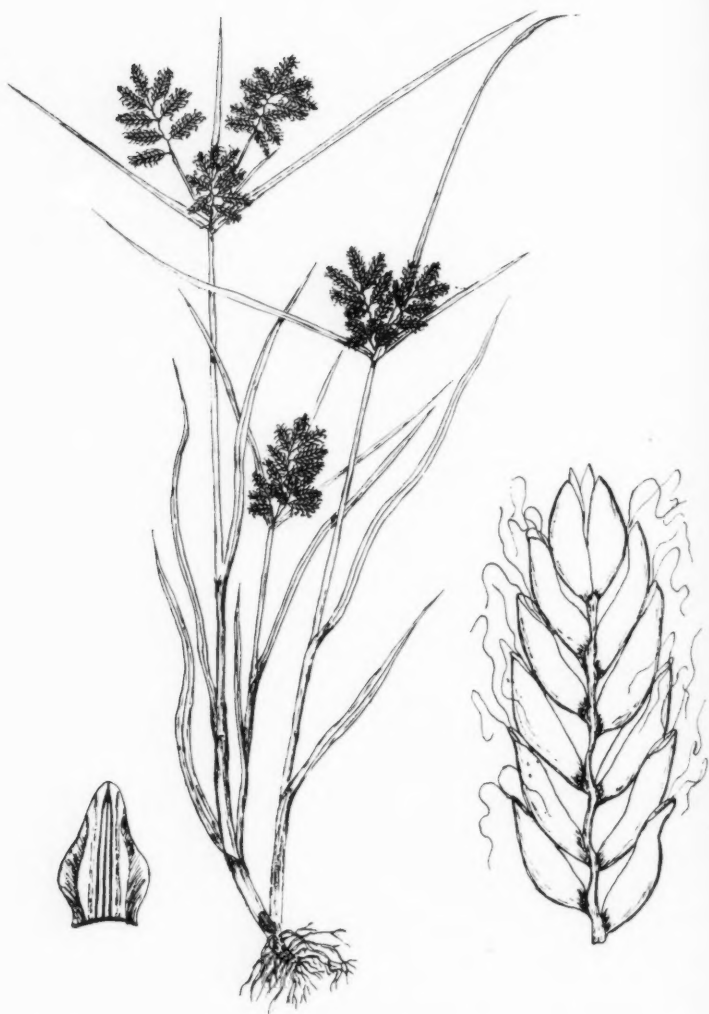


Fig. 2. *C. diandrus* Torr. Habit-drawing reduced 1/5; spikelet and scale x 7.5.



Fig.



Fig. 3. *C. rivularis* Kunth. Habit-drawing reduced 1/5; A. spikelet and scale of *C. rivularis*, x 7.5. B. spikelet and scale of *C. Nieuwlandii*, x 7.5.

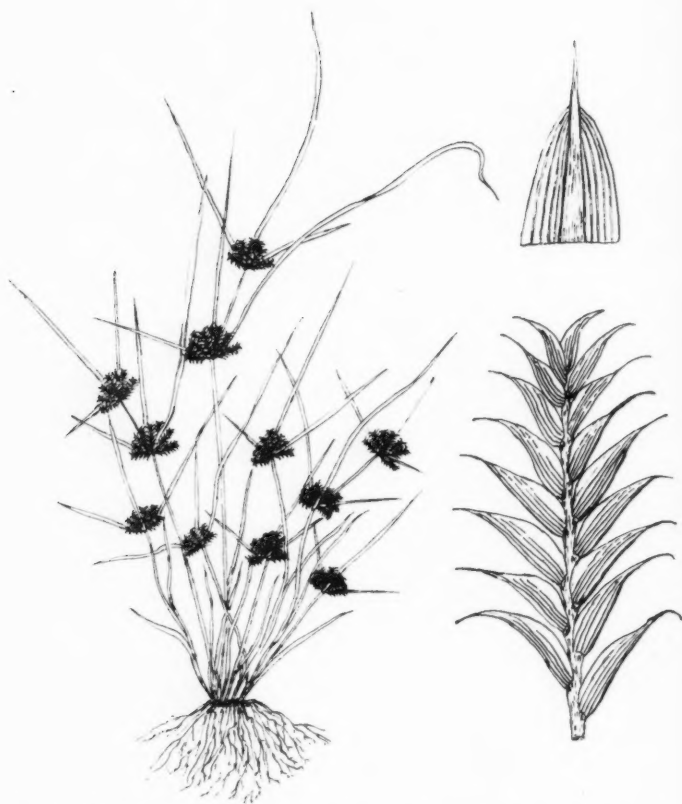


Fig. 4. *C. inflexus* Muhl. Habit-drawing reduced 1/5; spikelet and scale x 7.5.



Fig. 5. *C. pseudovegetus* Steud. Habit-drawing reduced 3/5; spikelet and scale x 7.5.



Fig. 6. *C. acuminatus* Torr. & Hook. Habit-drawing reduced 1/5; spikelet and scale x 7.5.



Fig. 7. *C. dentatus* Torr. Habit-drawing reduced 3/5; spikelet and scale x 7.5.



Fig. 8. *C. Schweinitzii* Torr. Habit-drawing reduced 1/5; spikelet x 4.5; scale x 7.5.



Fig. 9. *C. Houghtonii* Torr. Habit-drawing reduced 1/5; spikelet x 4.5; scale x 7.5.



Fig. 10. *C. mesochorus* Geise. Habit-drawing reduced $\frac{3}{5}$; spikelet $\times 4.5$; scale $\times 7.5$.



Fig. 11. *C. esculentus* L. Habit-drawing reduced 1/5; spikelet x 4.5; scale x 7.5.



Fig. 12. *C. strigosus* L. Habit-drawing reduced 3/5; spikelet x 4.5; scale x 7.5.



Fig. 13. *C. strigosus* var. *multiflorus* Geise. Habit-drawing reduced 1/5;
spikelet x 4.5; scale x 7.5.



Fig. 14. *C. ovularis* Torr. Habit-drawing reduced 1/5; spikelet and scale x 7.5.



Fig. 15. *C. filiculmis* Vahl. Habit-drawing reduced 1/5; spikelet and scale x 7.5.



Fig. 16. *C. speciosus* Vahl. Habit-drawing reduced 1/5; spikelet x 6; scale x 7.5.



Fig. 17. *C. Engelmanni* Steud. Habit-drawing reduced 1/5; spikelet and scale x 7.5.



Fig. 18. *C. erythrorhizos* Muhl. Habit-drawing reduced 1/5; spikelet and scale x 7.5.

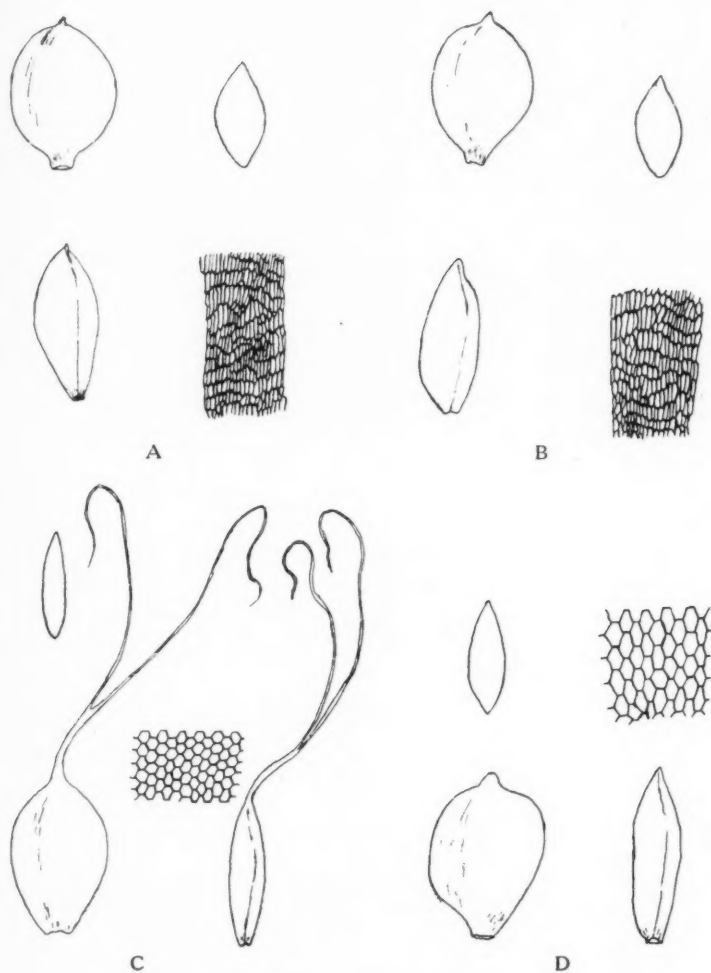


Fig. 19. Achenium, dorsal and lateral views, cross section and surface cells.

- A. *C. flavescent* L. x 20.
 B. *C. Nieuwlandii* Geise. x 20.
 C. *C. diandrus* Torr. x 20.
 D. *C. rivularis* Kunth. x 20.

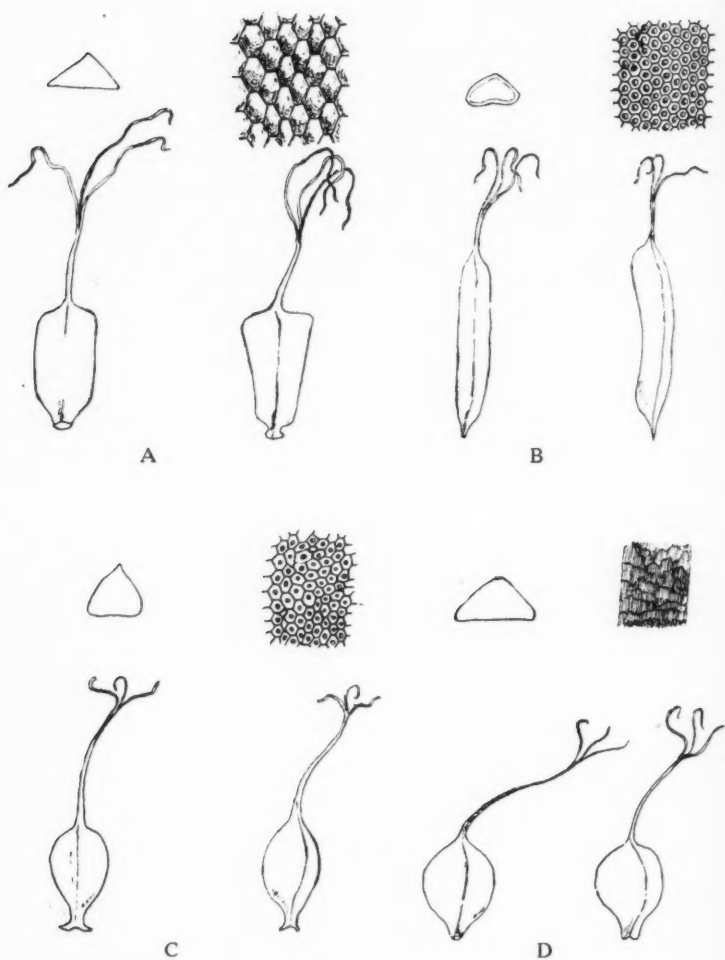
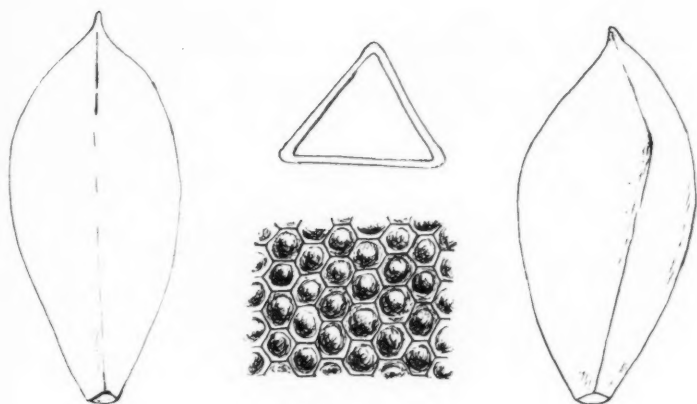
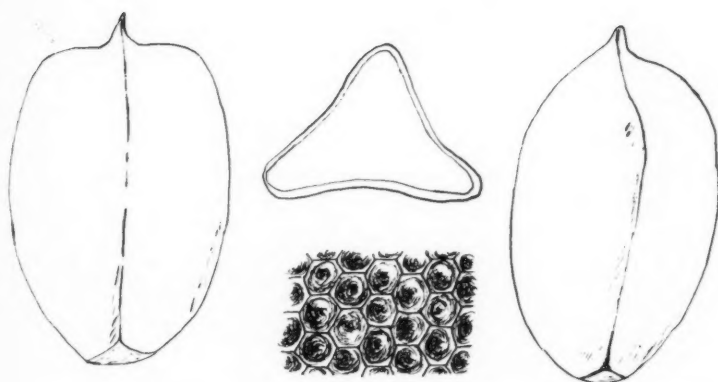


Fig. 20. Achenium, dorsal and lateral views, cross section and surface cells.

- A. *C. inflexus* Muhl. x 20.
- B. *C. pseudovegetus* Steud. x 20.
- C. *C. acuminatus* Torr. x 20.
- D. *C. dentatus* Torr. x 20.



A



B

Fig. 21. Achenium, dorsal and lateral views, cross section and surface cells.

A. *C. Schweinitzii* Torr. $\times 20$.

B. *C. Houghtonii* Torr. $\times 20$.

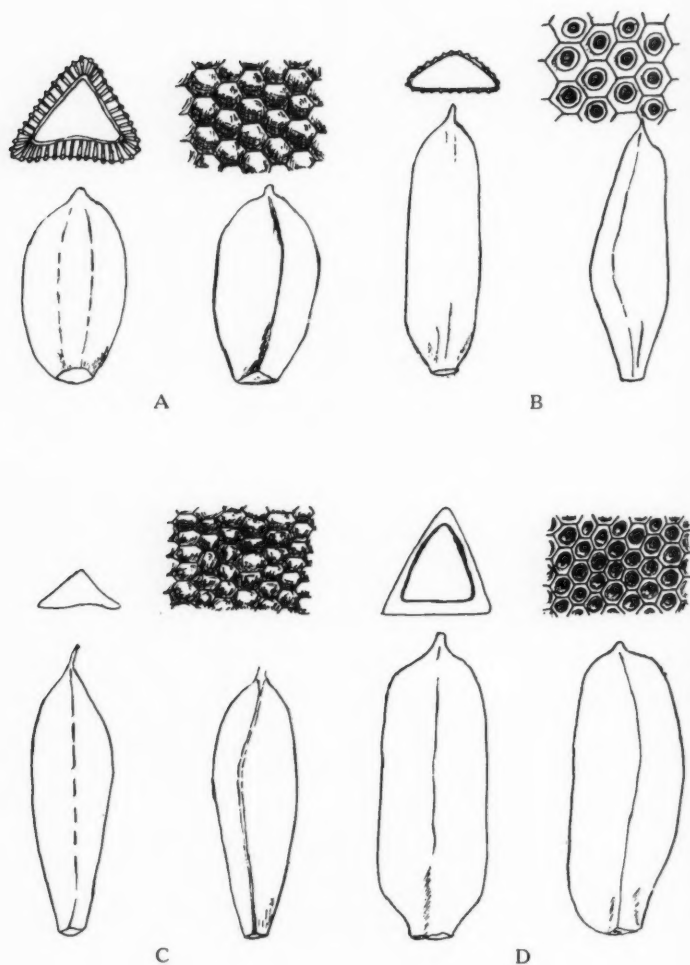


Fig. 22. Achenium, dorsal and lateral views, cross section and surface cells.

- A. *C. esculentus* L. x 20.
 B. *C. strigosus* L. x 20.
 C. *C. ovularis* (Michx.) Torr. x 20.
 D. *C. filiculmis* Vahl. x 20.

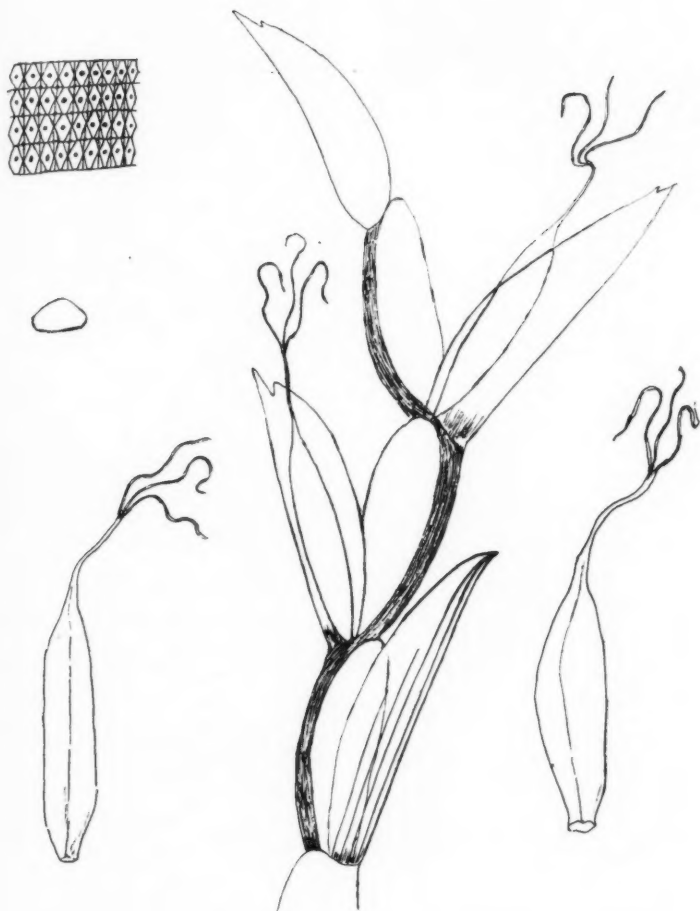


Fig. 23. Achenium, dorsal and lateral views, cross section and surface cells; sketch of rachis 20 diameters. *C. Engelmanni* Steud.

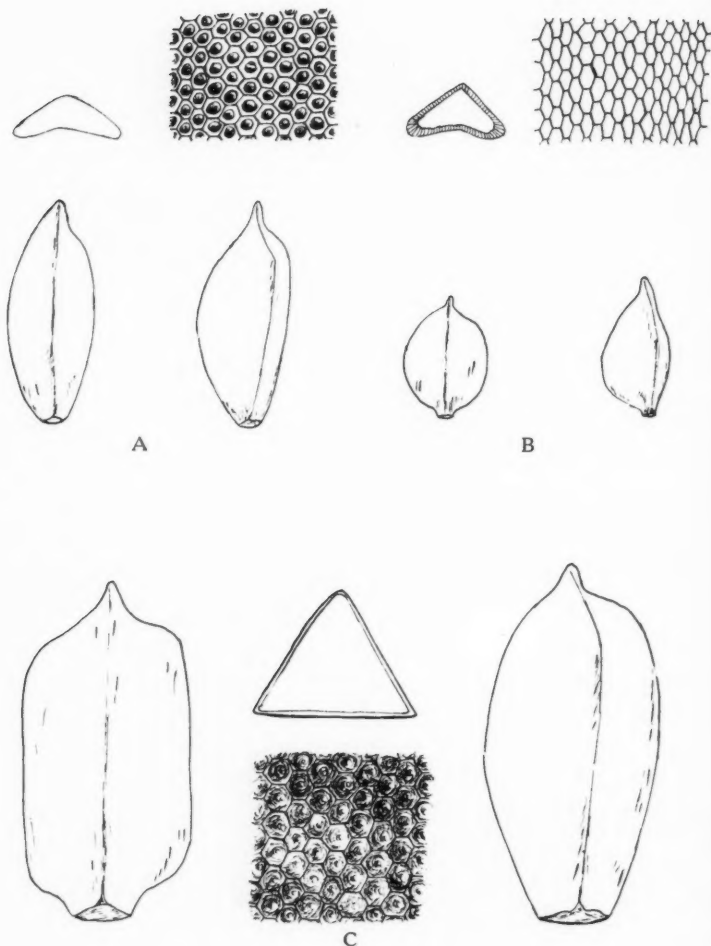


Fig. 24. Achenium, dorsal and lateral views, cross section and surface cells.

- A. *C. speciosus* Vahl. x 20.
 B. *C. erythrorhizos* Muhl. x 20.
 C. *C. mesochorus* Geise. x 20.

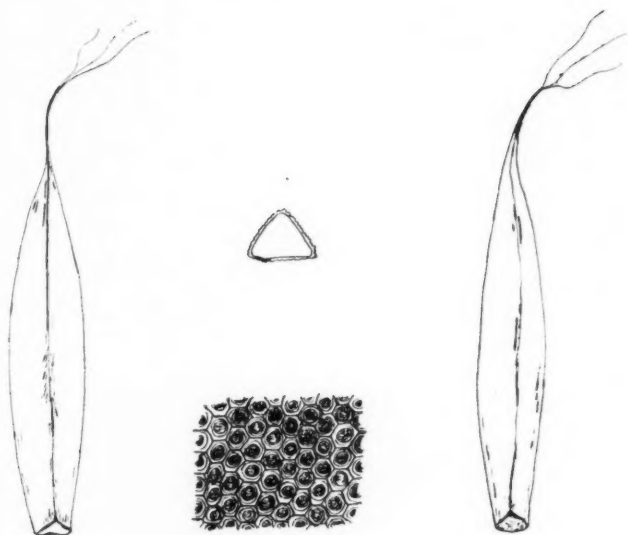
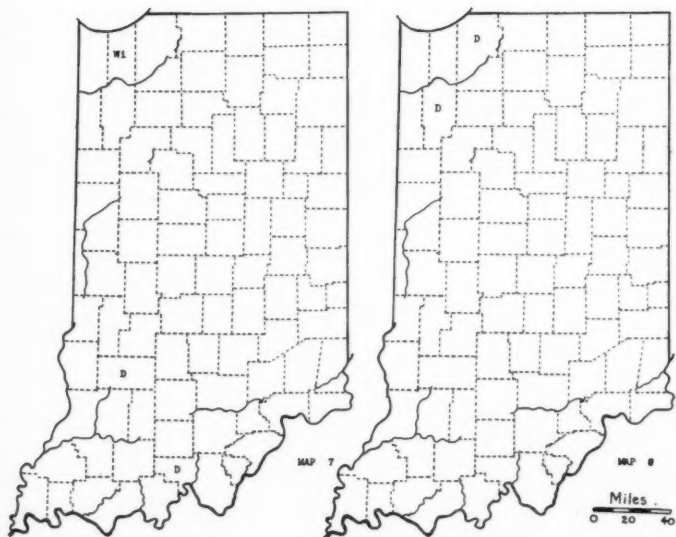
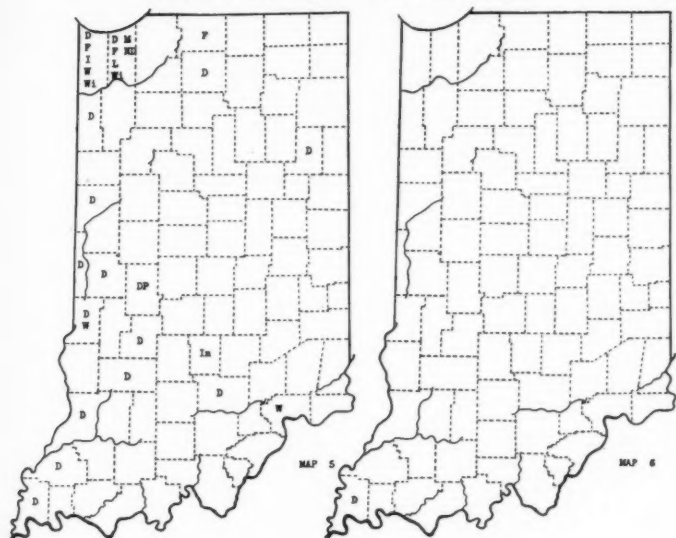
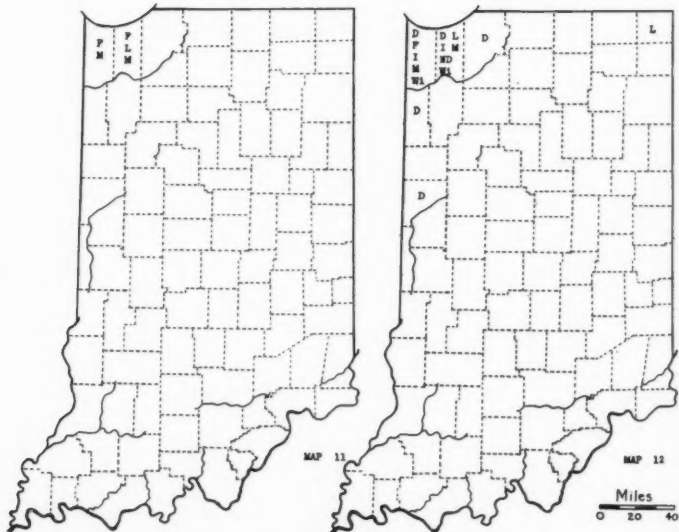
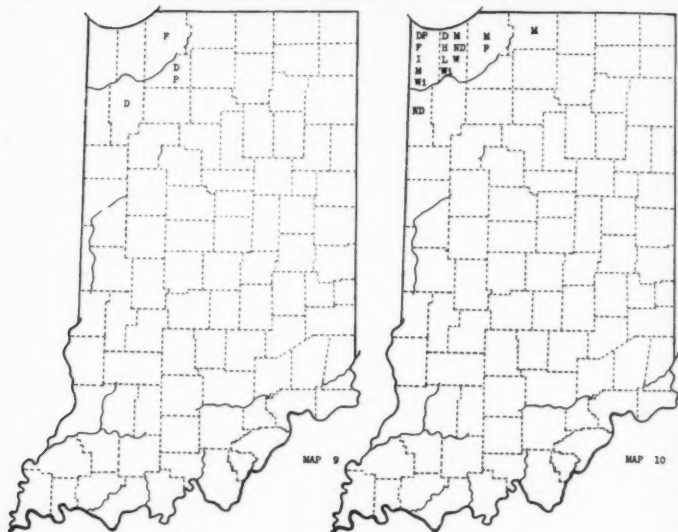


Fig. 25. Achenium, dorsal and lateral views, cross section and surface cells.
C. strigosus var. *multiflorus* Geise. x 20.



Map 5—*C. inflexus*
Map 6—*C. pseudovegetus*

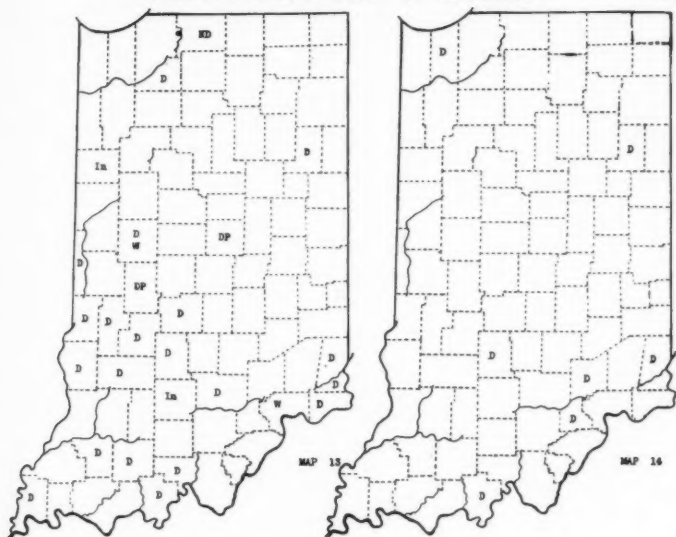
Map 7—*C. acuminatus*
Map 8—*C. dentatus*



Map 9—*C. dentatus* var. *clenostachys*
Map 10—*C. Schweinitzii*

Map 10—C. Schweinitzii

Map 11—*C. Houghtonii*Map 12—*C. mesochorus*

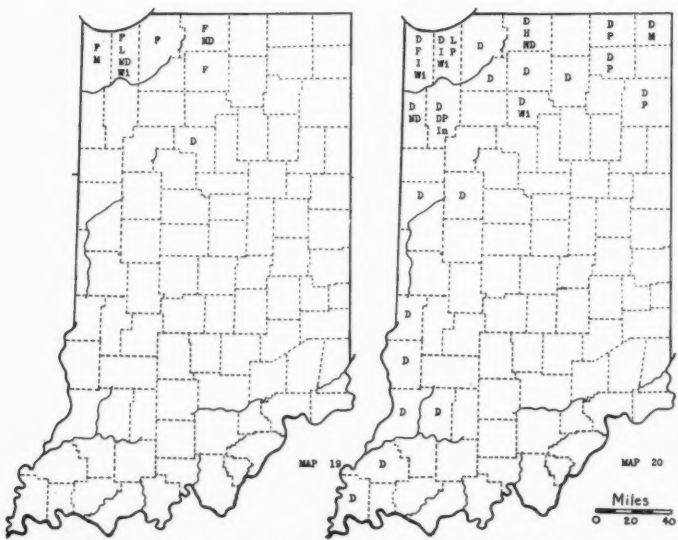
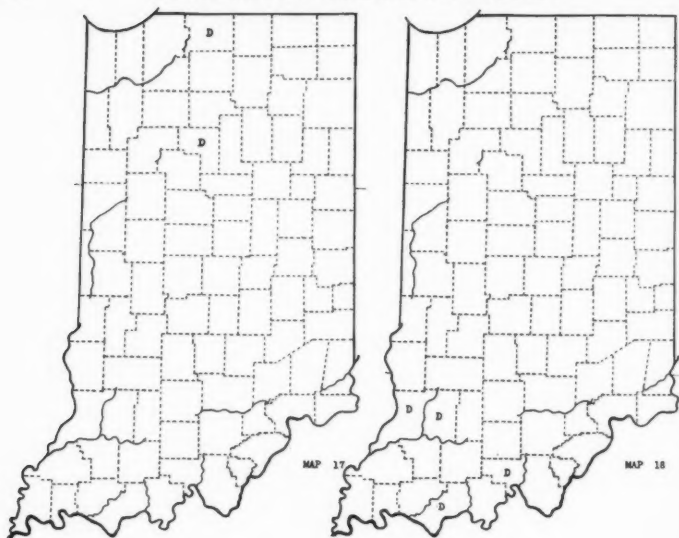


Map 13—*C. esculentus*

Map 14—*C. esculentus* var. *macrostachyus*

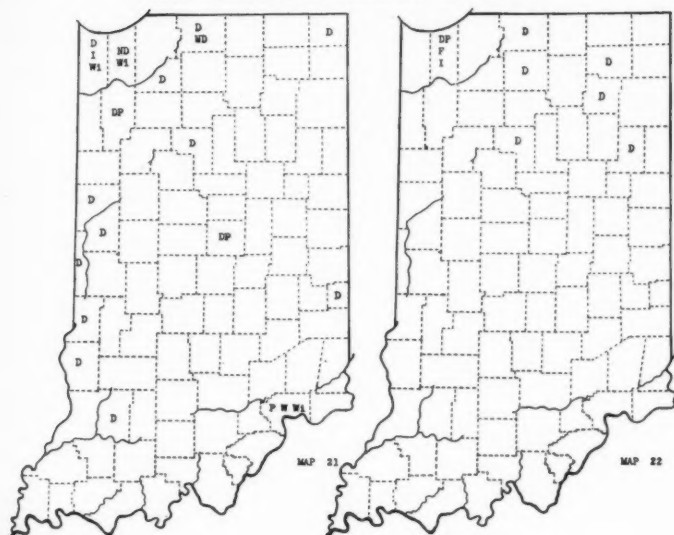
Map 15—*C. strigosus*

Map 16—*C. strigosus* var. *robustior*



Map 17—*C. strigosus* var. *multiflorus*
 Map 18—*C. ovularis*

Map 19—*C. filiculmis*
 Map 20—*C. filiculmis* var. *macilentus*



Map 21—*C. speciosus*

Map 22—*C. Engelmanni*

Map 23—*C. erythrorhizos*

THE INDIANA SPECIES OF SCIRPUS*

SR. M. ST. LEONA THORNTON, B.V.M.

Introduction and Acknowledgements

This paper is based on a study of the material available in the various herbaria of the State and vicinity.

It has been customary to divide the genus *Scirpus* into two subgenera on the basis of the presence or absence of a perianth of hypogynous setae until Fernald (1901) pointed out the inconsistency of this character. The grouping of the species as employed by J. K. Small in his "Manual of the southeastern flora" has been followed in this paper.

There are, according to herbaria specimens obtainable, fourteen species and five varieties indigenous to Indiana.

A list of the herbaria with number of specimens examined and species represented in each follows:

Herbaria	Specimens	Species
Butler University	13	6
Chas. C. Deam	259	14
De Pauw University	33	10
Field Museum	46	13
P. E. Hebert	5	4
University of Illinois	59	11
Indiana University	12	8
Marcus W. Lyons, Jr.	29	12
University of Notre Dame	37	10
University of Wisconsin	41	10

The following abbreviations for herbaria were used on the maps in indicating the geographical distribution of the various species:

B — Butler University	I — University of Illinois
D — Deam	In — University of Indiana
DP — De Pauw University	L — Marcus W. Lyon, Jr.
F — Field Museum	ND — University of Notre Dame
H — P. E. Hebert	Wi — University of Wisconsin

This study of the Indiana *Scirpi* was carried on under the direction of Dr. Theodor Just of the University of Notre Dame, to whom I wish to express my gratitude for his active interest and assistance throughout the work.

For the loan of herbarium material, I wish to thank Mr. Charles C. Deam, State Forester, Bluffton, Indiana; Dr. Paul C. Standley, Field Museum, Chicago, Illinois; Rev. J. A. Nieuwland and Rev. P. E. Hebert, University of Notre Dame, Notre Dame, Indiana; Dr. S. A. Cain, Indiana University, Bloomington, Indiana; Professor Ray C. Friesner, Butler University, Indianapolis, Indiana; Dr. T. C. Yuncker, De Pauw University, Greencastle, Indiana; Professor C. F. Hottes, University of Illinois, Urbana, Illinois; Dr. N. C. Fassett, University of Wisconsin, Madison, Wisconsin. I wish also to express my appreciation to the University of Notre Dame for the use of the E. L. Greene and the J. A. Nieuwland Libraries and Herbaria.

* Contributions to the Fauna and Flora of Indiana, No. 3.

SCIRPUS L. Sp. Pl. 47. 1753

Plants small, slender annuals, or small and large perennials; roots fibrous, rhizomes slender or stout; culms three-angled or terete, leafy or sheathed; involucre, 1-several leaved subtending inflorescence; inflorescence solitary, or in capitate clusters, umbellulate or paniculate; spikelets terete or somewhat flattened, few many flowered; scales spirally imbricated, all flower bearing, sometimes the lower empty; flowers hermaphroditic; perianth of 1-6 (or 8) hypogynous bristles, slender or strong, abbreviated or elongated, retrorsely barbed or smooth; stamens 2-3; style 2-3 cleft, partially deciduous.

KEY

- Involucral bract single or wanting.
 Involucral bract single or wanting, usually exceeding the inflorescence:
 spikelets solitary or rarely two, usually few-flowered: perianth present(*Caespitosi*)
 Involucral bract absent: scales obtuse: bristles barbed, longer or equal to achene: spikelets few-flowered.....*S. pauciflorus*
 Involucral bract present, erect twice as long as spikelet: scales acute: bristles barbed, shorter or equal to the achene.....*S. subterminalis*
 Involucral bract single, displacing laterally the entire inflorescence:
 spikelets few, sessile in head-like aggregates or in short petiolled umbellae: perianth present or absent.....(*Validi*)
 Involucral bract solitary, longer than inflorescence.
 Plants small, annual.
 Culms obtusely triangular: bristles unequal, achene lenticular.....*S. debilis*
 Culms terete: achene cuneate-obovate.
 Bristles wanting.....*S. Smithii*
 Bristles present.....*S. Smithii* var. *setosus*
 Plants tall, perennial.
 Culms sharply triangular: bristles equalling achene: achene smooth, plano-convex.....*S. americanus*
 Culms three-angled with concave sides: bristles surpassing achene: achene smooth, trigonous.....*S. Torreyi*
 Involucral bract solitary, shorter than inflorescence: culms terete, sheathed at base: achene lenticular.
 Bristles longer than achene.....*S. validus*
 Bristles equalling achene: scales red-spotted.....*S. acutus*
 Involucral bracts two or more: inflorescence terminal, compound, umbellate: perianth bristles present.....(*Sylvatici*)
 Involucral bracts two or more.
 Spikelets large: culms sharply triangular: bristles retrorsely barbed entire way: achene large.....*S. fluviatilis*
 Spikelets small, numerous, dark brown or reddish brown: culms obtusely triangular or terete.
 Bristles retrorsely barbed above.
 Bristles equalling or shorter than achene.
 Lower leaves nodulose: spikelets greenish brown.....*S. atrovirens*
 Lower leaves not nodulose: plant smaller.....*S. atrovirens* var. *georgianus*
 Bristles twice the length of the achene:
 plant leafy: spikelets reddish brown.....*S. polyphyllus*

- Bristles smooth: spikelets separate or in capitate clusters.
 Bristles not exceeding scales.....*S. lineatus*
 Bristles much exerted.
 Spikelets oval or cylindric, clustered at the end of the
 ray: fruit late.
 Rays elongated.
 Base of involucre brown.
 Spikelets oval.....*S. cyperinus*
 Spikelets cylindric.....*S. cyperinus* var. *Andrewsii*
 Base of involucre black.....*S. cyperinus* var. *pelius*
 Rays greatly abbreviated: spikelets crowded
S. cyperinus var. *condensatus*
 Spikelets oval, nearly all solitary on slender pedicels.....*S. pedicellatus*

1. *Caespitosi**S. pauciflorus* Lightf. Fl. Scot. 1078. 1777.

Fig. 1, map 1

Perennial; rootstocks filiform; culms slender, 28 cm. long; involucre bract wanting; spikelets solitary, 4.5 mm. long; scales obtuse; bristles retrorsely barbed all the way; style 3-cleft. July - October.

Distribution. — Quebec to British Columbia, New England, New York, Pennsylvania, Illinois. Specimens from Newton and Lake counties were examined.

Unpublished records: Lake (Hill, Lansing); Newton (McKee).

S. subterminalis Torr. Fl. U. S. I: 47. 1824.

Fig. 2, map 2

Perennial; rootstock slender; culms nodulose, filiform, 38 cm. long; leaves channeled; involucre leaf, erect, 2 cm. long, surpassing spikelets; inflorescence simple, spikelet 6 mm. x 2 mm., solitary, terminal, subcylindric to ovoid; scales ovate-lanceolate, acute, rather green in color, pointed, 4 mm. x 2 mm., bristles retrorsely barbed, shorter than achene, style 3 cleft; achene trigonous, brown, smooth, abruptly beaked, 2.5 x 1.5 mm.

Distribution. — Newfoundland to British Columbia, New Jersey, Pennsylvania, Michigan, Idaho.

Published records: Lake (Coulter for Hill).

Unpublished records: Porter (Deam).

2. *Validi**S. Smithii* A. Gray, Manual 5, 563. 1867.

Fig. 3, map 3

Culms slender, terete, leaf-bearing from upper sheaf; involucre leaf always erect, 6-11 cm. long; inflorescence simple spikelets solitary or in sessile cluster 1-5, ovoid, acute; scales oblong-oval, 2.5 x 1.5 mm., style 2 cleft, bristles none or minute; achene very flat, cuneate-obovate, 1.5 x 1.2 mm. July - Sept.

Distribution. — Maine to Pennsylvania, Illinois, Michigan, and Ontario. In the State of Indiana the range of this species is through La Porte, Mar-

shall, Kosciusko, Whitley counties. In general this plant enjoys moist sandy situations.

Published records: Carroll (Thompson), Kosciusko (Clark), La Porte (Coulter).

Unpublished records: Lake (Chase, Hill), La Porte (Barnes), Marshall and Whitley (Deam), Porter (Lyon, Umbach).

S. Smithii var. *setosus* Fern., Rhodora 3:252, 1901.

Map 4

Similar; perianth of 4-5 delicate retrorsely barbed bristles, mostly longer than achene; achene very flat, 1.7 x 1.2 mm.

Distribution. — Maine, Massachusetts, Illinois. Habitat — sandy marl borders or partially dried up lakes.

Published records: Noble county (Deam).

Unpublished records: Cass, Porter, Starke, Steuben, (Deam); Jasper, (Welch).

S. debilis Pursh, Fl. Am. Sept. 55. 1814.

Fig. 4, map 5

Annual, roots fibrous; culms obtusely triangular, tufted 10-25 mm. long; involucre leaf horizontal when mature, 2-5.5 cm.; inflorescence simple; spikelets 1-3, capitate, ovoid, obtuse 2 x 2 mm.; scales 3 x 2.5 mm.; bristles stout, retrorsely barbed equal or longer than achene, 1.7 x 1.2 mm., broadly obovoid, mucronate. Aug. - Sept.

Distribution. — Maine to Minnesota and southwest. It is found growing on sandy or muddy shores.

Published records: Lake (Hill); Marion (Douglas).

Unpublished records: Porter (Umbach); Lake (Hill).

S. americanus Pers., Syn. 1:68. 1805.

Fig. 5, map 6

Perennial; rootstock, long stout and running; culms sharply three-angled with concave sides, 30-100 cm. long; leaves elongated, keeled and channeled; involucre leaf pointed and solitary, 3-10 mm. long; inflorescence simple; spikelets 1-6 capitate, oblong-ovoid, acute, 8-12 mm. long; scales 2 cleft at the apex, margins scarious; anthers tipped with an awl-shaped minutely fringed appendage; style usually 2 cleft; bristles retrorsely barbed, shorter than achene. Achene 2.7 x 2 mm., smooth, plano-convex, obovate, mucronate. Aug. - Oct.

Distribution. — temperate North America, north to Newfoundland. Also in South America and Europe. Indiana specimens examined were chiefly from northern part of state. This plant is found along borders of lakes and rivers.

Published records: Gibson and Posey (Schneck), Hamilton (Wilson), Jasper (Welch), Kosciusko (Clarke), Noble (Van Gorder), Steuben (Bradner), Vigo (Blatchley), Whitley (Deam).

Unpublished records: Allen, Cass, Elkhart, Grant, Harrison, Huntington, Jennings, Kosciusko, Lagrange, Lake, La Porte, Marshall, Noble, Starke,

Steuben, Wabash, Wayne, Wells (Deam); Hamilton (Wilson); Lake (Bebb, Lansing, Moffatt, Umbach); Lawrence (Kriebel); Newton (McKee); Porter (Lansing, Lyon, Umbach); St. Joseph (Nieuwland).

S. Torreyi Olney, Proc. Providence Frank. Soc. 1:32. 1847.

Fig. 6, map 7

Perennial, rootstocks short and slender; culms sharply three-angled with concave sides; 4-1.5 mm. tall; leaves twice as long as culms, narrowly linear, nodulose, channeled; involucre leaf blunt, 12-13 cm. long; inflorescence simple, spikelets 1-4, capitate, oblong; scales ovate, glabrous, slightly mucronate; bristles retrorsely barbed, longer than achene; style 3 cleft; achene unequally triangular, smooth. Aug. - Sept.

Distribution. — Maine to Pennsylvania, west to Iowa and Manitoba. This species grows in swamps and on the margins of streams.

Published records: Lake and Porter (Hill).

Unpublished records: Jasper (Deam); Lake (Moffatt, Umbach); Porter (Chase, Hill, Lyon, Umbach).

S. validus Vahl, Enum. 2: 268. 1806.

Fig. 7, map 8

Perennial; rhizome stout, scaly, horizontal; culms sheathed, stout, terete, 1-3 mm. high; involucre leaf 4.5 cm. long, shorter than inflorescence; inflorescence lax, decompound umbel, rays 1-6 cm. long, bractlet brownish; spikelets 5-12 mm. long in capitate clusters 1-5, sessile or rayed; scales 2 x 2.5 mm., mucronate, pubescent; perianth, retrorsely barbed bristles, equalling or longer than achene; style 2-cleft; achene dull black when ripe, 2 x 1.5 mm., obovate, mucronate, plano-convex. July - August.

Distribution. — North America and West Indies. Its distribution in Indiana is rather general. The specimens examined were from northeastern and southwestern counties. The habitat of this species may be ditches, boggy marshes, drained swamps and sloughs, sandy and muddy soils.

Published records: Delaware, Jay, Randolph, Wayne (Phinney); Gibson and Posey (Schneck); Hamilton and Marion (Wilson); Jasper (Welch); Kosciusko (Clark); Noble (Van Gorder); Putnam (MacDougal and Erlanson); Steuben (Bradner); Tippecanoe (Cunningham); Vermillion (Wright); Vigo (Blatchley); White (Heimlich); Whitley (Deam).

Unpublished records: Allen, Blackford, Carroll, Cass, Clay, Daviess, Dearborn, DeKalb, Gibson, Grant, Hamilton, Hancock, Jackson, Jasper, Jay, Knox, Kosciusko, La Porte, Noble, St. Joseph, Shelby, Spencer, Starke, Sullivan, Vigo, Wayne, Wells, White (Deam); Jasper (Welch); Kosciusko (Enochs); Lake (Deam, Umbach); Porter (Lyon); Putnam (Grimes); Starke (Cain).

S. acutus Muhl. ex Bigelow, Fl. Bost. 15. 1804.

Fig. 8, map 9

S. lacustris, var. *occidentalis* Wats. Bot. Cal. II. 218. 1880.

S. occidentalis (Wats.) Chase, Rhodora, VI. 68, t. 53. 1904.

Perennial, rootstock horizontal and scaly; culms sheathed at base, 1.2-3

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m. long; involucre bract, obscurely 3-sided; inflorescence a compound erect, congested umbel; spikelets cylindric, 2-7, capitate, densely fruited, 1-2 cm. long; scales 3-4 mm. long, longer than achene, aristate, viscid, red-dotted, twice as long as scales of *S. validus*; bristles retrorsely barbed, slightly shorter than achene; style 2 cleft; achene unequally biconvex or lenticular, 2.5 x 1.5 mm. Aug. - Sept.

Distribution. — Newfoundland to British Columbia, south to Massachusetts, New York, Great Lakes, Missouri. Specimens examined were from counties in the northern part of state. Found in marshes and on borders of lakes and streams.

Unpublished records: Benton, De Kalb, Elkhart, Lake, Lagrange, Noble, Porter, Steuben, (Deam); Hamilton (Wilson); Jasper (Welch); Lake (Hill); Porter (Lyon); Posey (Chase); Randolph (Umbach); Vigo (Blatchley); Whitley (Williamson).

3. *Sylvatici*

S. fluviatilis (Torr.) Gray, Man. 527. 1848.

Fig. 9, map 10

Perennial; rootstock strong, often tuberous; culms sharply and equally triangular, stout, 1-1.5 m. high; leaves 0.7-2 cm. wide, linear, tapering gradually to a point; involucre leaves 3-5, often 20 cm. long; inflorescence a terminal umbel; spikelets solitary or clustered at end of rays or sessile in center, cylindric, 10-17 mm. long, 2-10 mm. wide; scales scarious, aristate; bristles retrorsely barbed, equalling achene; achene 3.8 x 1.5 mm., sharply triangular, pointed, obovoid. July - Sept.

Distribution. — Massachusetts and Vermont to D. C., west to Minnesota, Kansas. In Indiana this species has a northwestern range. It grows in shallow water along lakes and large streams, in dredged ditches and marshland.

Published records: Delaware, Jay, Randolph, Wayne (Phinney); Vigo (Blatchley).

Unpublished records: Allen, Blackford, Cass, Jay, Knox, Lake, Newton, Noble, Steuben, Wells, Whitley (Deam); Knox (Schneck); Lake (Hill); Porter (Lyon); St. Joseph (Hebert).

S. atrovirens Muhl. Gram. 43. 1817.

Fig. 10, map 11

Perennial by slender rootstalks; culms rather stout, leaves 7-14 mm. wide, lower sheaths cellular, nodulose; involucre leaves unequal as long as inflorescence; inflorescence umbellulate, once or twice compound; spikelets small, 2-3 mm. x 1.5-2 mm., dark brown in dense clusters of 10-30; scales 1.5-2 mm. x .5-.75 mm., ovate oblong, acute; bristles retrorsely barbed above middle and equalling achene; style 3-cleft; achene trigonous, 1.2 x .75 mm. July - Aug.

Distribution. — Maine to Saskatchewan, south to Georgia and Louisiana. Extremely common in Indiana. It grows in swamps, meadows and bogs; along creeks, ditches and roadsides, in heavy or light soil.

Published records: Delaware, Jay, Randolph, Wayne (Phinney); Hamil-

ton and Marion (Wilson); Jasper (Welch); Noble (Van Gorder); Tippecanoe (Cunningham); Vigo (Blatchley); Whitley (Deam).

Unpublished records: Allen, Benton, Blackford, Cass, Clinton, Crawford, Daviess, Dearborn, Elkhart, Grant, Hamilton, Huntington, Jay, Jennings, Kosciusko, Lagrange, La Porte, Marshall, Miami, Monroe, Newton, Noble, Parke, Porter, Posey, Pulaski, Putnam, Ripley, Randolph, St. Joseph, Scott, Starke, Steuben, Tippecanoe, Wabash, Warren, Wayne, Wells, White, Whitley (Deam); Jasper (Welch); Newton (McKee); Porter (Deam, Hill, Lansing, Lyon); Putnam (Deam, Grimes, Yuncker); St. Joseph (Just and Nieuwland); Vigo (Blatchley).

S. atrovirens var. *georgianus* (Harper) Fern. Rhodora 23:134, 1921.

Map 12

Similar, plant more slender; leaves 4-10 mm. wide, lower sheaths not nodulose, nearly smooth; bristles shorter or equalling the achene.

Distribution. — Quebec to Michigan, Georgia and Arkansas.

Unpublished records: Adams, Bartholomew, Boone, Clay, Decatur, Dubois, Floyd, Gibson, Greene, Hamilton, Harrison, Hendricks, Jackson, Knox, Madison, Martin, Ohio, Orange, Owen, Perry, Pike, Shelby, Steuben, Sullivan, Vermillion, Warrick (Deam); Brown, (Friesner); Noble, Randolph, Wells (Deam); Porter (Umbach); St. Joseph (Just and Nieuwland).

S. polyphyllus Vahl, Enum. 2:274. 1806.

Fig. 11, map 13

Perennial; rootstock slender; culms sharply triangular, very leafy, 7 cm.-10 cm. high; leaves many, 3 ranked, scabrous, involucre leaves 3-6, unequal, exceeding inflorescence; inflorescence, open, decomposed umbel; spikelets reddish brown, ovoid, 2.5-3.5 mm. x 1.5-2.5 mm., capitate, 3-10 at end of rays, rarely solitary; scales 1-1.5 mm. long about equal to achene, bristles retrorsely barbed above middle, twice the length of the achene; achene obovoid, unequally trigonous, short-pointed, 1.2 x .8 mm. July-Sept.

Distribution. — N. E. to Minnesota, southwest to Georgia and Arkansas. In Indiana, the species is found chiefly in southern counties. It grows in swamps, wet woods, meadows and borders of ponds.

Published records: Putnam (Erlanson).

Unpublished records: Clark, Clay, Daviess, Jackson, Jennings, Owen, Perry, Ripley, Vigo (Deam); Monroe (Haas, Potzger); Putnam (Grimes, McDougall); Wells (Williamson).

S. lineatus Michx. Fl. Bor. Am. 1: 32. 1803.

Fig. 12, map 14

Perennial, rootstock stout; culms 0.5-1.5 m. high, erect, triangular, slightly leafy; leaves 0.5-1 cm. wide, linear, flat, stiff, scabrous; inflorescence a lax umbel, terminal and axillary; spikelets solitary at end of drooping pedicels, oblong-cylindric, 6 x 2 mm.; scales, green-keeled, ovate, pointed; bristles flexuous, smooth, entangled, much longer than achene, equal to scales or slightly

exserted when mature; achene oblong-obovoid, trigonous, sharply mucromate. June - Aug.

Distribution. — Virginia to Georgia, westward to Kansas, Texas and Oregon. In Indiana this species has a rather scattered range. It is found growing in swamps and meadows, in sandy soils.

Published records: Decatur (Ballard); Jasper (Welch); Putnam (Erlanson); Whitley (Deam).

Unpublished records: Allen, Bartholomew, Benton, Blackford, Boone, Carroll, Cass, Crawford, Dearborn, De Kalb, Gibson, Grant, Greene, Hancock, Harrison, Huntington, Jackson, Jefferson, Jennings, Kosciusko, Lagrange, Lake, Madison, Montgomery, Newton, Noble, Orange, Posey, Putnam, Randolph, Ripley, Shelby, Spencer, Steuben, Tippecanoe, Warren, Warwick, Wayne, White (Deam); Jasper (Lansing, Welch); Lake (Lansing, Johnson); Porter (Lansing); Putnam (Bailey, Grimes); Randolph (Umbach); St. Joseph (Hebert, Just, Nieuwland); Steuben (Brown).

S. cyperinus (L.) Kunth, Enum. 2: 170. 1837

Fig. 13, map 15

Perennial; rootstock stout; culms terete, stiff, stout, leafy, 1-1.5 m. high; leaves elongated, linear, rigid, longer than culm; involucre leaves 3-6, two about as long as inflorescence; inflorescence a terminal compound umbel, spikelets oval in clusters of 3-15 at end of pedicels, 3-4 mm. \times 1.5-2.5 mm.; scales lanceolate, acute; bristles rust-colored, smooth, entangled, much exserted forming light brown wool; style 3 cleft; achene white, trigonous, mucronate, 0.75 \times 0.5 mm. Aug. - Sept.

Distribution. — Newfoundland to Ontario, Saskatchewan, Florida and Louisiana. The specimens examined are from both northern and southern parts of the state. Found in low grounds and wet meadows, swamps, boggy soil.

Published records: Delaware, Randolph, Jay, Wayne (Phinney); Gibson and Posey (Schneck); Hamilton, Marion (Deam, Wilson); Jasper (Welch); Kosciusko (Clark); Noble (Van Gorder); Putnam (Erlanson); Steuben (Bradner); Tippecanoe (Cunningham); Vigo (Blatchley).

Unpublished records: Adams, Allen, Cass, Clark, Crawford, De Kalb, Dubois, Elkhart, Fulton, Grant, Greene, Hamilton, Harrison, Jackson, Jasper, Knox, Lagrange, Lake, La Porte, Marshall, Martin, Monroe, Newton, Noble, Owen, Pike, Porter, Pulaski, Spencer, Starke, Steuben, Washington, Wells, Whitley (Deam); Jasper (Welch); Lake (Chase, Deam, Lansing); La Porte (Hebert, Hill); Marion (Cain); Monroe (Patzger); Newton (McKee); Porter (Chase, Friesner, Hill, Lyon, Umbach); Putnam (Grimes, McDougall, Welch); St. Joseph (Nieuwland); Sullivan (Deam).

S. cyperinus var. *Andrewsii* Fern. Proc. Am. Acad. 34: 501. 1899.

Map 16

Similar to type; base of involucre leaves light brown, involucels reddish-brown; spikelet cylindric, 5.5 \times 2.5 mm. (abbreviated on account of drought). Ordinarily 7-10 mm. in length.

Distribution.—The specimens from Allen county were examined. The variety was closely associated with typical form.

Published record: Allen County (Deam).

S. cyperinus var. *pelius* Fern. Rhodora 8: 164, 1906.

Map 17

Plant slender; leaves 7 mm, wide, shorter than culms; two involuclral leaves longer than inflorescence, involuclers and involuclral leaves black at base.

Distribution.—Newfoundland to Ontario, New York, Michigan. This variety is represented in the state by specimens from Whitley Lake, Kosciusko, Lawrence and Porter counties.

Unpublished records: Lake (Deam, Lansing); Lawrence (Wible); Porter (Hill); Whitley (Deam).

S. cyperinus var. *condensatus* Fern. Proc. Am. Acad. 34: 501. 1899.

Map 18

Like typical form except rays greatly abbreviated, spikelets in dense clusters.

Distribution.—Newfoundland to Ontario, New York, Michigan. Frequent in sandy soil. Closely associated with *S. cyperinus*.

Unpublished records: La Porte (Hill); Porter (Deam, Hill).

S. pedicellatus Fern. Rhodora 2: 16. 1900.

Fig. 14, map 19

Perennial; rhizome rather stout; culms terete, stout, 1.3-1.5 m. long; inflorescence paniculate; spikelets 3.5 x 2.5 mm., elliptic-oval on slender, drooping pedicels; scales pale brown; bristles entangled, smooth, very long, exserted, making whitish brown wool; achene 0.75 x 0.5 mm., trigonous, sharp-pointed; early flowering period (shedding achenes during July and early August) — striking field character. July - August.

Distribution.—Quebec, New England, westward across northern border to Wisconsin. In Indiana this species has a rather scattered range. It is found growing in alluvial thickets and swamps.

Published record: Brown (Bartlett).

Unpublished records: Blackford, Brown, Clay, Delaware, Dubois, Fulton, Jasper, Jefferson, Jennings, Lake, Posey, Ripley, St. Joseph, Scott, Steuben, Sullivan, Switzerland, Warrick, Wells (Deam); Kosciusko (Umbach); Monroe (Price, Welch); Newton (McKee); Porter (Lyon, Umbach); St. Joseph (Nieuwland).

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BIBLIOGRAPHY

- ABRAMS, LEROY. 1923—An illustrated flora of the Pacific States, vol. 1, pp. 269-277.
- BARTRAM, EDWIN B. 1922—*Scirpus pedicellatus* in New Jersey. *Torreyia*, vol. 22, pp. 67-68.
- BENTHAM, G. AND J. D. HOOKER. 1883—*Genera Plantarum*, vol. 3, pt. 2, pp. 1049-1051.
- BLATCHLEY, W. S. 1896—A catalogue of the uncultivated ferns and fern allies and the flowering plants of Vigo County, Indiana. *Ind. Geol. Report* 21, pp. 579-590.
- BRITTON, N. L. AND A. BROWN. 1913—*Illustrated flora of the Northern States, Canada and the British Possessions*, ed. 2, vol. 1, pp. 326-337.
- CHAPMAN, A. W. 1860—*Flora of the Southern United States*, pp. 519-521.
- CHASE, AGNES. 1904—The northern allies of *Scirpus Lacustris*. *Rhodora*, vol. 6, pp. 65-71.
- CLARK, H. WALTON. 1902—*Flora of Eagle Lake and vicinity*. *Proc. Ind. Acad. Science*, 1901, pp. 128-192.
- COULTER, J. M. 1874—A partial list of the flora of Jefferson County, Indiana. *Ind. Geo. Report* 6, p. 271.
- COULTER, STANLEY. 1899—A catalogue of the flowering plants and the ferns and their allies, indigenous to Indiana. *Ind. Geo. Report* 24, pp. 653-655.
- DEAM, CHAS. C. 1930—Plants new or rare in Indiana. XV. *Proc. Ind. Acad. Science*, 1929, vol. 39, pp. 123-125.
- DOUGLASS, BENJ. W. 1905—Additions to the flora of Marion County with notes on plants heretofore unreported from the State of Indiana. *Proc. Ind. Acad. Science*, 1904, pp. 223-224.
- ERLANSON, EILEEN WHITEHEAD. 1924—List of Indiana plants, chiefly from Putnam County, collected 1910-1915 by Earl J. Grimes. *Proc. Ind. Acad. Science*, 1923, vol. 33, pp. 123-162.
- FASSETT, NORMAN C. 1930—"Cyperaceae" in PEATTIE, D. C. *Flora of the Indiana Dunes*, pp. 82-84.
- FERNALD, M. L. 1900—Some northeastern species of *Scirpus*. *Rhodora*, vol. 2, pp. 15-21.
- 1901—*Scirpus supinus* and its North American allies. *Rhodora*, vol. 3, pp. 249-252.
- 1906—Some new or little known Cyperaceae of Eastern North America. *Rhodora*, vol. 8, pp. 163-167.
- 1920—*Scirpus acutus* Muhl. *Rhodora*, vol. 22, pp. 55-56.
- GATES, FRANK C. 1924—The persistency of *Scirpus validus*. *Am. Journal Bot.*, vol. 2, pp. 513-517.
- HEIMLICH, LOUIS F. 1923—Plants of White County, V. *Proc. Ind. Academy Science*, 1922, pp. 281-289.

- HIGLEY, WILLIAM K. AND CHAS. S. RADDIN. 1891—The flora of Cook County, Illinois and a part of Lake County, Ind. Bull. Chi. Acad. Science, vol. 2, pp. 128-129.
- JEPSON, WILLIS LINN. 1923-1925—A manual of the flowering plants of California, pp. 150-156.
- LONG, BAYARD.—Range extension of *Scirpus Smithii* var. *setosus*. Rhodora, vol. 12, pp. 155-156.
- LUNELL, J. 1915—An allied species of *S. americanus* Pers. Am. Midl. Nat., vol. 4, p. 230.
- LYON, MARCUS WARD, JR.—List of flowering plants and ferns in the Dunes State Park and vicinity, Porter County, Ind. Am. Midl. Nat., vol. 12, p. 22.
- MILLSPAUGH, CHARLES F.—Plantae Yucatanæ. Fac I. Gramineæ and Cyperaceæ. Field Columbian Museum, Publication 69, Bot. Series, vol. 3, No. 1.
- ROBINSON, BENJ. L. AND MERRETT L. FERNALD. 1907—Gray's new manual of Botany, ed. 7, pp. 187-195.
- RYDBERG, PER AXEL. 1932—Flora of the prairies and plains of Central North America, pp. 150-154.
- RYDBERG, P. A. 1917.—Flora of the Rocky Mountains and adjacent plains, pp. 108-111.
- SMALL, J. K. 1933—Manual of the southeastern flora, 3rd ed., pp. 167.
- WELCH, WINONA H. 1927—Enumeration of the vascular flora of Jasper County, Indiana. Proc. Indiana Acad. of Science, 1926, vol. 36, pp. 213-220.
- WIEGAND, KARL M. AND ARTHUR J. EAMES. 1925—The flora of the Cayuga Lake Basin. Memoir 92, Cornell U. Agricultural Exp. Station, pp. 96-101.

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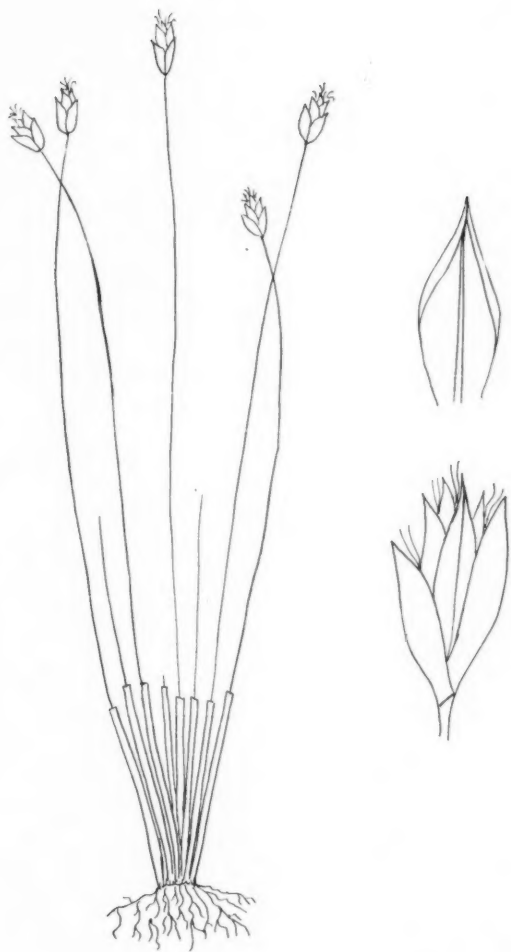


Fig. 1. *S. pauciflorus* Lightf. Habit sketch $4/5$ natural size; spikelet and scale $\times 8$.



Fig. 2. *S. subterminalis* Torr. Habit sketch 4/5 natural size; spikelet and scale x8.

Fig.



Fig. 3. *S. Smithii* Gray. Habit sketch 4/5 natural size; spikelet and scale x8.

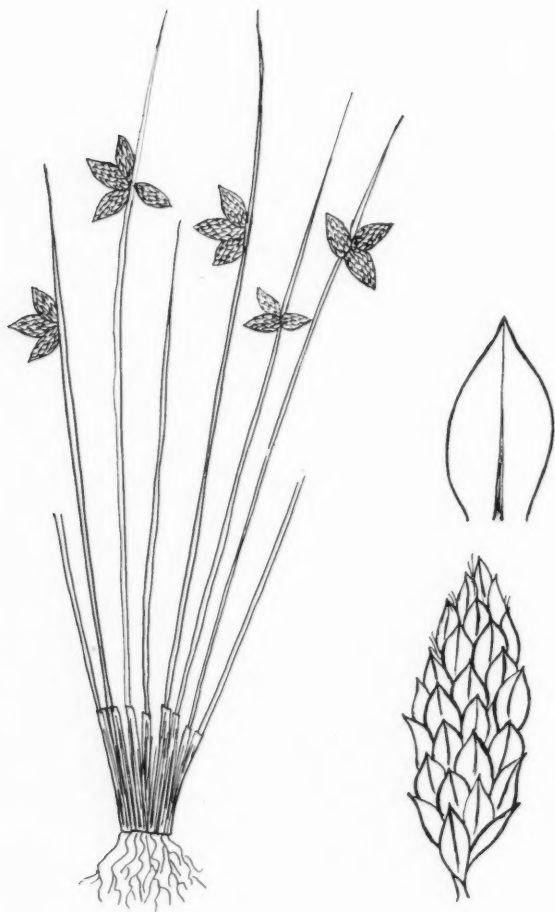


Fig. 4. *S. debilis* Pursh. Habit sketch 4/5 natural size; spikelet and scale x8.

Fig. 5.

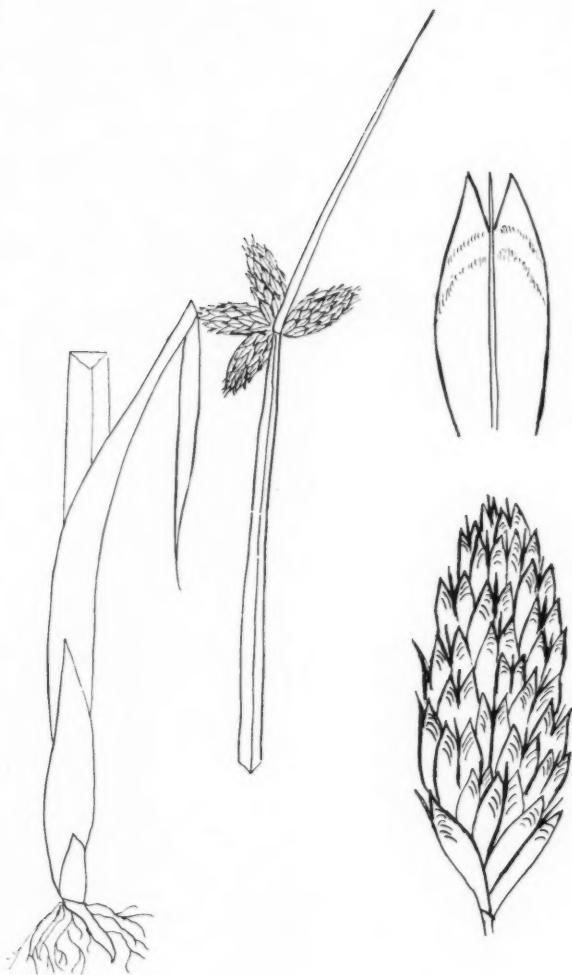


Fig. 5. *S. americanus* Pers. Habit sketch 4/5 natural size; spikelet x6.4, and scale x8.

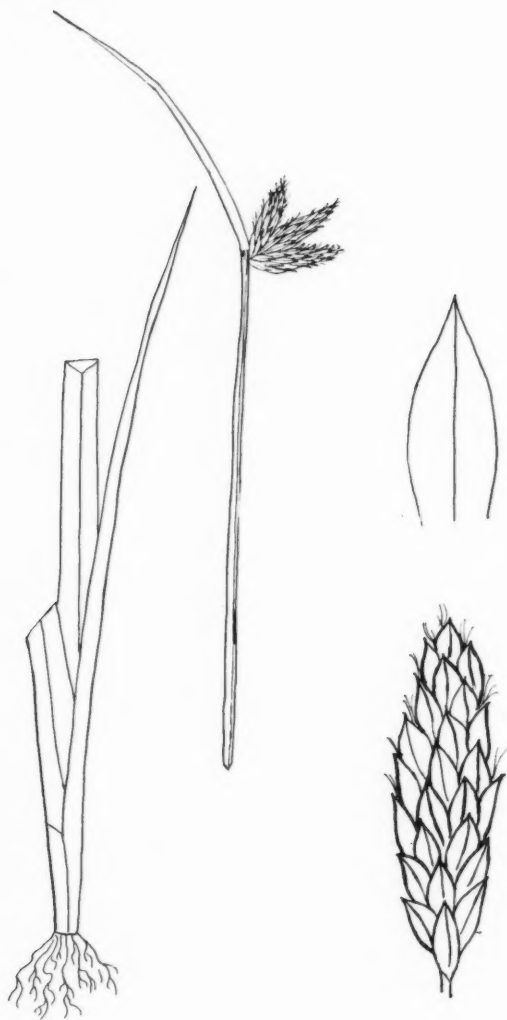


Fig. 6. *S. Torreyi* Olney. Habit sketch 4/5 natural size; spikelet and scale x8.



Fig. 7. *S. validus* Vahl. Habit sketch 4/5 natural size; spikelet and scale $\times 8$.

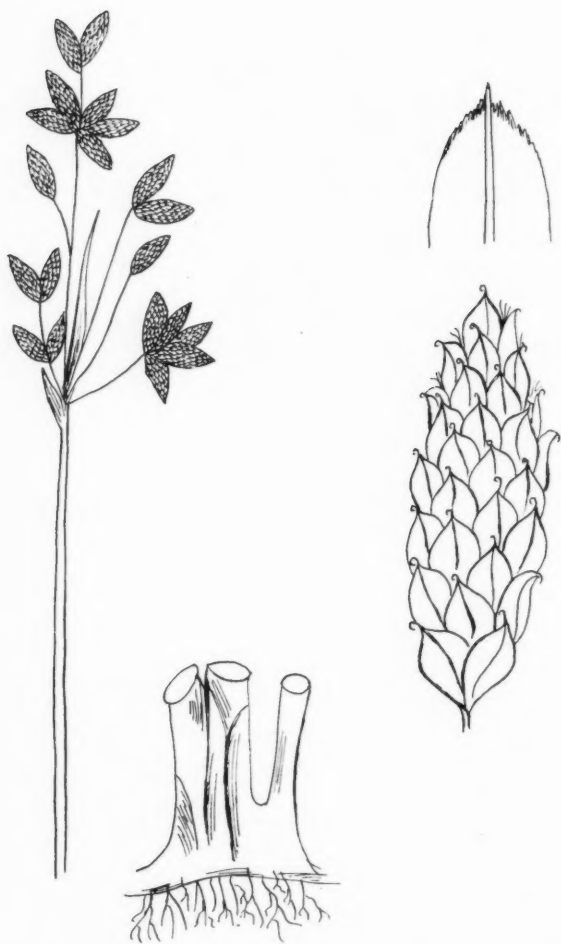


Fig. 8. *S. acutus* Muhl. Habit sketch 4/5 natural size; spikelet and scale x8.



Fig. 9. *S. fluviatilis* (Torr.) Gray. Habit sketch 1/2 natural size; spikelet x2.5; scale x8.



Fig. 10. *S. atrovirens* Muhl. Habit sketch 4/5 natural size; spikelet x9.6; scale x8.

Fig.



Fig. 11. *S. polyphyllus* Vahl. Habit sketch $\frac{4}{5}$ natural size; spikelet x16; scale x8.



Fig. 12. *S. lineatus* Michx. Habit sketch 4/5 natural size; spikelet x9.6; scale x8.

Fig. 13.



Fig. 13. *S. cyperinus* (L.) Kunth. Habit sketch 4/5 natural size; spikelet x9.6; scale x8.



Fig. 14. *S. pedicellatus* Fern. Habit sketch 4/5 natural size; spikelet x9.6; scale x8.

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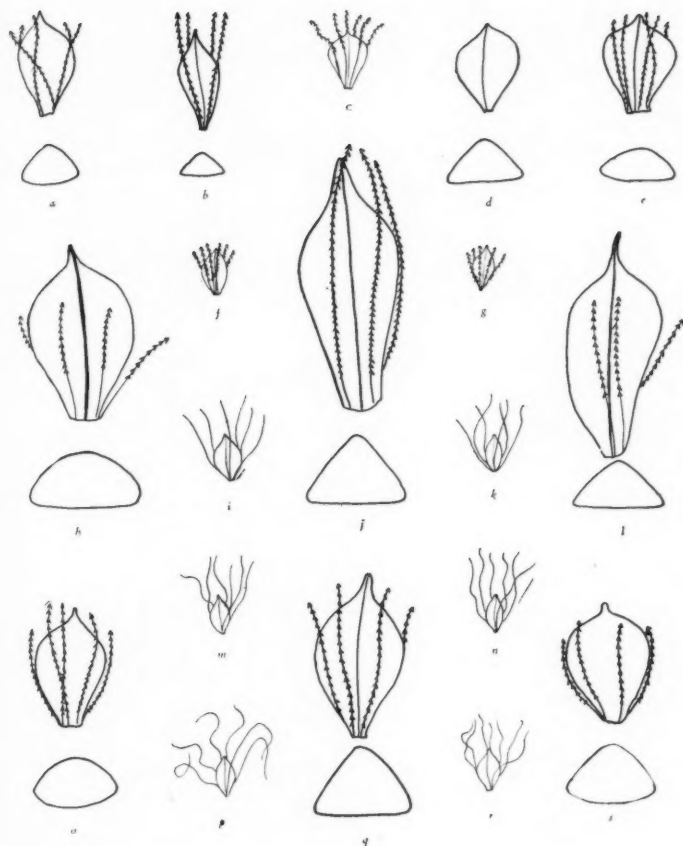
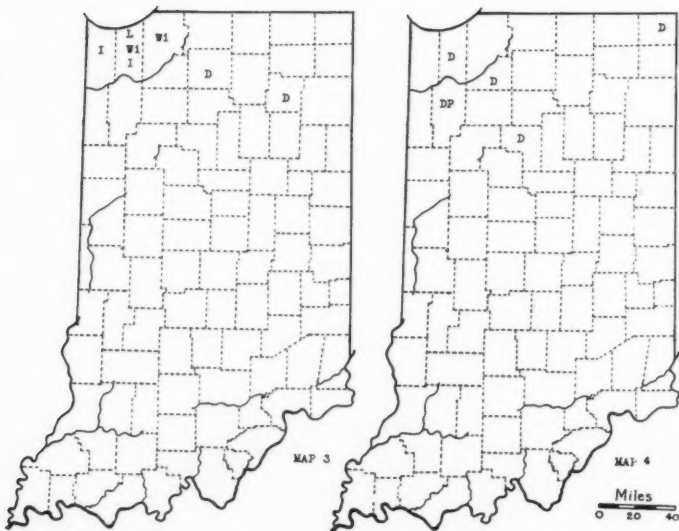
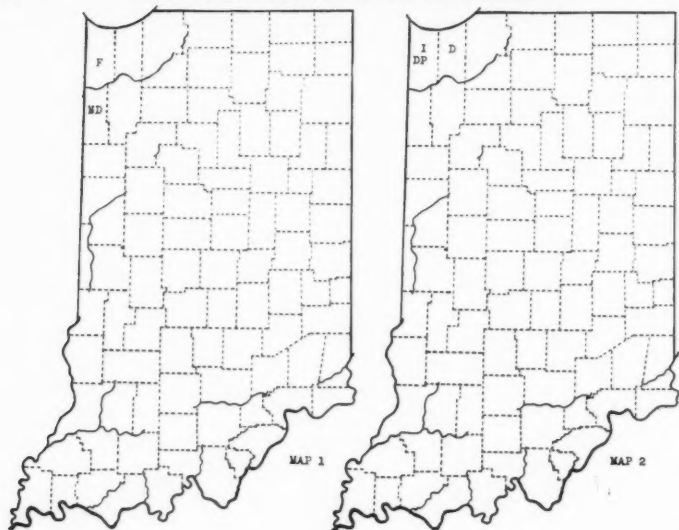


Fig. 15. All figures with the exception of c, f, g, i, k, m, n, p, r, show both dorsal and transverse views of the achenes, x 16. a) *S. debilis* Pursh. b) *S. pauciflorus* Lightf. c) *S. polyphyllus* Vahl. d) *S. Smithii* Gray. e) *S. Smithii* var. *setosus* Fern. f) *S. atrovirens* Muhl. g) *S. atrovirens* var. *georgianus* (Harper) Fern. h) *S. americanus* Pers. i) *S. lineatus* Michx. j) *S. fluviatilis* (Torr.) Gray. k) *S. cyperinus* (L.) Kunth. l) *S. Torreyi* Olney. m) *S. cyperinus* var. *Andrewsii* Fern. n) *S. cyperinus* var. *pelius* Fern. o) *S. validus* Vahl. p) *S. pedicellatus* Fern. q) *S. subterminalis* Torr. r) *S. cyperinus* var. *condensatus* Fern. s) *S. acutus* Muhl.

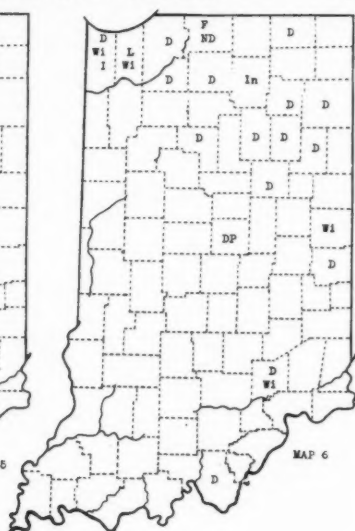


Map 1—*S. pauciflorus*
Map 3—*S. Smithii*

Map 2—*S. subterminalis*
Map 4—*S. Smithii* var. *setosus*



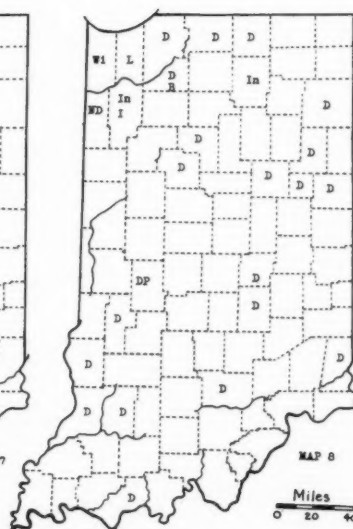
MAP 5



MAP 6



MAP 7



MAP 8

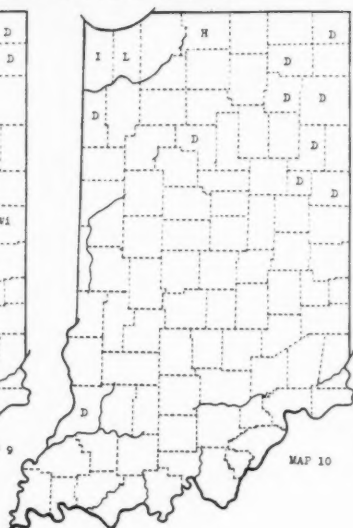
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Map 5—*S. debilis*
Map 7—*S. Torreyi*

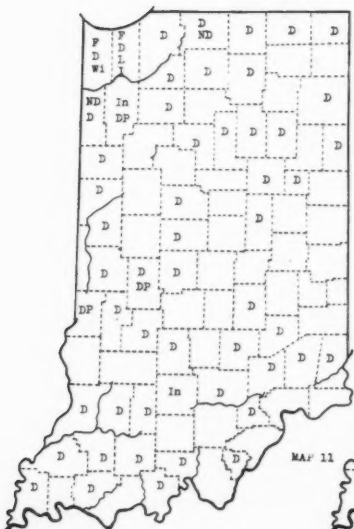
Map 6—*S. americanus*
Map 8—*S. validus*



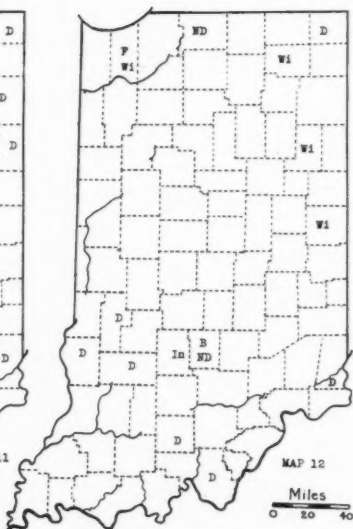
MAP 9



MAP 10



MAP 11



MAP 12

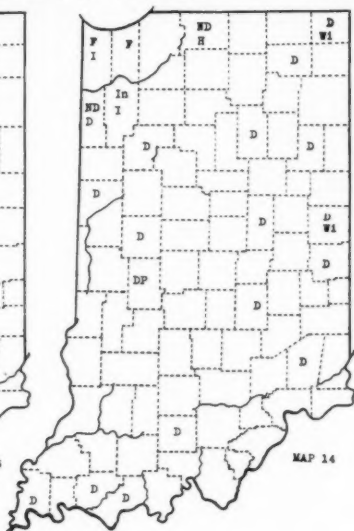
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Map 9—*S. acutus*
Map 11—*S. atrovirens*

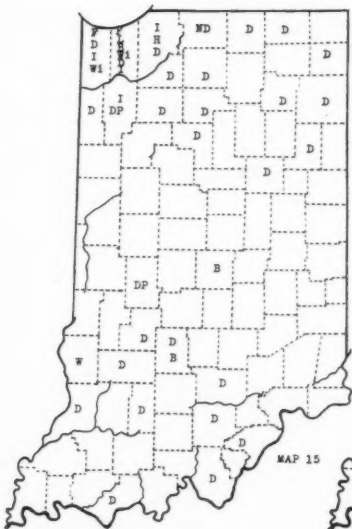
Map 10—*S. fluvialilis*
Map 12—*S. atrovirens* var. *georgianus*



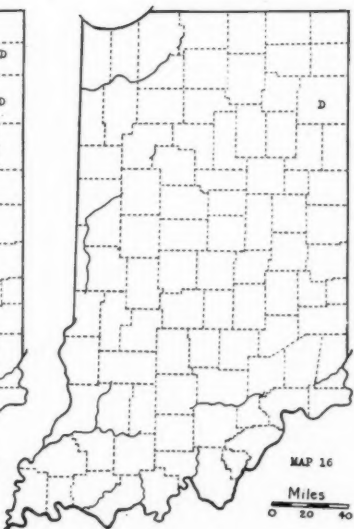
MAP 13



MAP 14



MAP 15

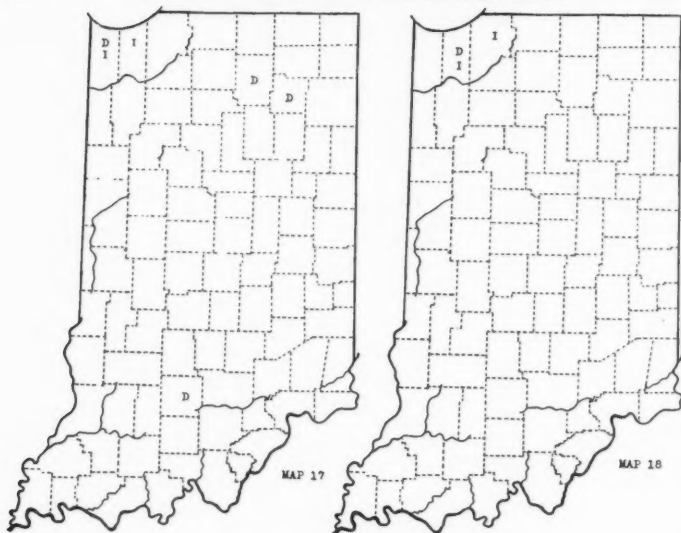


MAP 16

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Map 13—*S. polyphyllus*
Map 15—*S. cyperinus*

Map 14—*S. lineatus*
Map 16—*S. cyperinus* var. *Andrewsii*



Map 17—*S. cyperinus* var. *pelius* Map 18—*S. cyperinus* var. *condensatus*
 Map 19—*S. cyperinus* var. *pedicellatus*

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FERNS AND FLOWERING PLANTS OF BERRIEN COUNTY, MICHIGAN

P. E. HEBERT, C.S.C.

The following list of ferns and flowering plants of Berrien County, Michigan, is a part result of a seven years' hobby. The list does not purport to be exhaustive of the flora of the county. We have some eight hundred and ninety-five species from its confines and there are probably some three or four hundred more. Mounted specimens of all plants enumerated may be found in a separate section of the Herbarium of the University of Notre Dame. There are a number of species represented in the University collections which we did not find time to sift, and there is an account of the flora of Warren Woods (a small section of the county) by Cecil Billington (Papers of the Michigan Academy of Science, Arts and Letters, vol. IV, pt. 1, pp. 81-110, pls. 3, 1925). Further findings may be published later. English names are given for the benefit of those who may find them interesting. The text has not been encumbered with the "stations" from which the different specimens were gathered. These may be had from the labels. Species that are considered rare for the area are indicated by an asterisk. The nomenclature of the ferns follows that of Nieuwland (Am. Midl. Nat., vol. 1, 1909), that of the grasses Deam (Grasses of Indiana, 1929) while that of the other flowering plants, with few exceptions, Britton and Brown (An Illustrated Flora of the Northern United States, Canada and the British Possessions, 2nd ed., 1913).

- **Botrychium neglectum* Wood. Wood's Grape-fern.
- Botrychium obliquum* Muhl. Ternate Grape-fern.
- Botrychium dissectum* Spreng. Cut-leaved Grape-fern.
- Botrychium virginianum* (L.) Sw. Virginia Grape-fern.
- Osmunda regalis* L. Royal Fern.
- Osmunda cinnamomea* L. Cinnamon-fern.
- Osmunda Claytoniana* L. Clayton's Fern.
- Onoclea sensibilis* L. Sensitive Fern.
- **Matteuccia Struthiopteris* (L.) Todaro. Ostrich-fern.
- Filix fragilis* (L.) Underw. Brittle Fern.
- Polystichum acrostichoides* (Michx.) Schott. Christmas-fern.
- Thelypteris noveboracensis* (L.) Nieuwl. New York Fern.
- Thelypteris palustris* (L.) Schott. Marsh Shield-fern.
- Thelypteris cristata* (L.) Nieuwl. Crested Shield-fern.
- Thelypteris Goldiana* (Hook.) Nieuwl. Goldie's Fern.
- Thelypteris marginalis* (L.) Nieuwl. Evergreen Wood-fern.
- Thelypteris spinulosa* (Muell.) Nieuwl. Spinulose Shield-fern.
- Thelypteris intermedia* (Muhl.) House. American Shield-fern.
- Thelypteris hexagonoptera* (Michx.) Weatherby. Broad Beech-fern.
- Anchistea virginica* (L.) Presl. Virginia Chain-fern.

- Asplenium platyneuron* (L.) Oakes. Ebony Spleenwort.
Athyrium angustifolium (Michx.) Milde. Narrow-leaved Spleenwort.
Athyrium angustum (Willd.) Presl. Lady-fern.
Athyrium thelypteroides (Michx.) Desv. Silvery Spleenwort.
Adiantum pedatum L. Maiden-hair Fern.
Pteridium latiusculum (Desv.) Hieron. Bracken Fern.
Polypodium virginianum L. Common Polppody.
Equisetum arvense L. Field Horsetail.
Equisetum hyemale L. Common Scouring-rush.
Equisetum laevigatum A. Br. Smooth Scouring-rush
Lycopodium lucidulum Michx. Shining Club-moss.
Lycopodium obscurum L. Ground-pine.
Selaginella apoda (L.) Fernald. Creeping Selaginella.
Pinus Strobus L. White Pine.
Pinus Banksiana Lamb. Labrador Pine.
Larix laricina (Du Roi) Koch. American Larch.
Tsuga canadensis (L.) Carr. Hemlock.
Thuja occidentalis L. White Cedar.
Juniperus communis L. Common Juniper.
Juniperus sibirica Burgsd. Low Juniper.
Juniperus virginiana L. Red Cedar.
Taxus canadensis Marsh. American Yew.
Typha latifolia L. Broad-leaved Cat-tail.
Potamogeton americanus Cham. & Schl. Long-leaved Pondweed.
Potamogeton compressus L. Eel-grass. Pondweed.
Triglochin maritima L. Seaside Arrow-grass.
Alisma subcordatum Raf. American Water-plantain.
Philotria canadensis (Michx.) Britton. Water-weed.
Hierochloa odorata Wahl. Holy Grass. Velvet Grass.
Andropogon scoparius Michx. Broom Beard-grass.
Andropogon provincialis Lam. Forked Beard-grass.
Sorghastrum nutans (L.) Nash. Indian Grass.
Sorghum halepense (L.) Pers. Johnson Grass.
Digitaria Ischaemum Schreb. Small Crab-grass.
Digitaria sanguinalis (L.) Scop. Large Crab-grass.
Leptoloma cognatum (Schultes) Chase. Diffuse Crab-grass
Paspalum stramineum Nash. Straw-colored Paspalum.
Echinochloa Crus-galli (L.) Beauv. Cockspur-grass.
Panicum dichotomisflorum Michx. Spreading Witch-grass.
Panicum capillare L. Witch-grass
Panicum virgatum L. Switch-grass.
Panicum depauperatum Muhl. Starved Panic-grass.
Panicum perlongum Nash. Long-stalked Panic-grass.
Panicum dichotomum L. Forked Panic-grass.
Panicum huachucae Ashe. Hairy Panic-grass.
Panicum huachucae var. *silvicola* Hitchc. & Chase.
Panicum praecocius Hitchc. & Chase. Early-branching Panic-grass.

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Phleu
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**Holo*
Avena
Danth
Sparti
Eleusi
Triod
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**Sph*

- Panicum meridionale* Ashe. Matting Panic-grass.
Panicum Scribnerianum Nash. Scribner's Panic-grass.
Panicum Ashei Pearson. Ashe's Panic-grass.
Panicum latifolium L. Broad-leaved Panic-grass.
Panicum Boscii Poir. Bose's Panic-grass.
Panicum clandestinum L. Corn Grass.
Setaria lutescens (Weigel) Hubbard. Yellow Foxtail.
Setaria viridis (L.) Beauv. Green Foxtail.
Cenchrus pauciflorus Benth. Sandbur.
Leersia virginica Willd. White Grass.
Leersia oryzoides (L.) Swartz. Rice Cut-grass.
Aristida purpurascens Poir. Arrow-grass.
Stipa avenacea L. Black Oat-grass.
Oryzopsis asperifolia Michx. White-grained Mountain-rice.
Oryzopsis racemosa (J. E. Smith) Ricker. Black-fruited Mountain-rice.
Milium effusum L. Tall Millet-grass.
Muhlenbergia Schreberi Gmel. Nimble Will.
Muhlenbergia mexicana (L.) Trin. Satin-grass.
Muhlenbergia racemosa (Michx.) B.S.P. Wild Timothy.
Muhlenbergia tenuifolia (Willd.) B.S.P. Slender Satin-grass.
Muhlenbergia foliosa Trin.
Brachyelytrum erectum (Schreb.) Beauv. Bearded Short-husk.
Phleum pratense L. Timothy.
Alopecurus aequalis Sobolewski.
Alopecurus ramosus Poir.
Sporobolus canovirens Nash. Grey-green Rush-grass.
Sporobolus asper (Michx.) Kunth. Long-leaved Rush-grass.
Sporobolus cryptandrus (Torr.) A. Gray. Sand Dropseed.
Cinna arundinacea L. Wood Reed-grass.
Agrostis stolonifera var. *maior* (Gaudin) Farwell.
Agrostis perennans (Walt.) Tuckerm. Upland Bent-grass.
Agrostis hyemalis (Walt.) B.S.P. Rough Hair-grass.
Calamagrostis canadensis (Michx.) Beauv. Blue-joint Grass.
Calamagrostis inexpansa A. Gray. Bog Reed-grass.
Ammophila breviligulata Fernald. Sea Sand-reed.
Calamovilfa longifolia (Hook.) Hack. Long-leaved Reedgrass.
**Holcus lanatus* L. Velvet-grass.
Avena sativa L. Oats.
Danthonia spicata (L.) Beauv. Common Wild Oat-grass.
Spartina Michauxiana Hitchc. Tall Marsh-grass.
Eleusine indica (L.) Gaertn. Yard-grass.
Triodia flava (L.) Hitchc. Tall Red-top.
Eragrostis pectinacea (Michx. Nees.
Eragrostis cilianensis (Allioni) Link.
Eragrostis hypnoides (Lam.) B.S.P.
Eragrostis spectabilis (Pursh) Steud.
**Sphenopholis obtusata* (Michx.) Scribn. Early Bunch-grass.

- Cyperus strigosus* L. Straw-colored Cyperus.
Cyperus filiculmis Vahl. Slender Cyperus.
Cyperus filiculmis var. *macilentus* Fernald.
Eriophorum viridicarinatum (Engelm.) Fernald. Thin-leaved Cotton-grass.
Eriophorum virginicum L. Virginia Cotton-grass.
Scirpus americanus Pers. Three-square.
Scirpus validus Vahl. American Great Bulrush.
Scirpus sylvaticus L. Wood Bulrush.
Scirpus atrovirens Muhl. Dark-green Bulrush.
Scirpus lineatus Michx. Reddish Bulrush.
Scirpus cyperinus (L.) Kunth. Wool-grass.
Eleocharis Robbinsii Oakes. Robbin's Spike-rush.
Eleocharis obtusa (Willd.) Schultes. Blunt Spike-rush.
Eleocharis acicularis (L.) R. & S. Needle Spike-rush.
Eleocharis acuminata (Muhl.) Nees. Flat-stemmed Spike-rush.
Eleocharis intermedia (Muhl.) Schultes. Matted Spike-rush.
Stenophyllus capillaris (L.) Britton. Hair-like Stenophyllus.
Mariscus mariscoides (Muhl.) Kuntze. Twig-rush.
Rynchospora corniculata (Lam.) A. Gray. Horned Rush.
Rynchospora alba (L.) Vahl. White Beaked-rush.
Rynchospora capillacea Torr. Capillary Beaked-rush.
Rynchospora glomerata (L.) Vahl. Clustered Beaked-rush.
Scleria reticularis Michx. Reticulated Nut-rush.
Carex siccata Dewey. Dry-spiked Sedge.
Carex convoluta Mackenzie.
Carex Muhlenbergii Schk. Muhlenberg's Sedge.
Carex cephalophora Muhl. Oval-headed Sedge.
Carex grvida Bailey. Heavy Sedge.
Carex sparganioides Muhl. Bur-reed Sedge.
Carex alopecoidea Tuckerm. Foxtail Sedge.
**Carex conjuncta* Boott. Soft Fox Sedge.
Carex vulpinoidea Michx. Fox Sedge.
Carex prairea Dewey. Prairie Sedge.
Carex stipata Muhl. Awl-fruited Sedge.
Carex trisperma Dewey. Three-fruited Sedge.
Carex canescens L. Silvery Sedge.
Carex Deweyana Schwein. Dewey's Sedge.
Carex bromoides Schk. Brome-like Sedge.
Carex interior Bailey. Inland Sedge.
Carex Leersii Willd. Little Prickly Sedge.
Carex seorsa E. C. Howe. Weak Stellate Sedge.
Carex scoparia Schk. Pointed Broom Sedge.
Carex tribuloides Wahl. Blunt Broom Sedge.
Carex cristatella Britton. Crested Sedge.
Carex tenera Dewey. Straw Sedge.
Carex normalis Mackenzie. Larger Straw Sedge.
Carex brevior (Dewey) Mackenzie.

- Carex Bicknellii* Britton. Bicknell's Sedge.
Carex alata Torr. Broad-winged Sedge.
Carex Jamesii Schwein. James' Sedge.
Carex leptalea Wahl. Bristle-stalked Sedge.
Carex communis Bailey. Fibrous-rooted Sedge.
Carex pennsylvanica Lam. Pennsylvania Sedge.
Carex varia Muhl. Emmons' Sedge.
Carex umbellata Schk. Umbel-like Sedge.
Carex tonsa (Fernald) Bicknell. Deep-green Sedge.
Carex hirtifolia Mackenzie. Pubescent Sedge.
**Carex eburnea* Boott. Bristle-leaved Sedge.
**Carex aurea* Nutt. Golden-fruited Sedge.
Carex tetanica Schk. Wood's Sedge.
Carex plantaginea Lam. Plaintain-leaved Sedge.
Carex Careyana Torr. Carey's Sedge.
Carex digitalis Willd. Slender Wood Sedge.
Carex laxiculmis Schwein. Spreading Sedge.
Carex albusina Sheldon. White Bear Sedge.
Carex blanda Dewey. Woodland Sedge.
Carex laxiflora Lam. Loose-flowered Sedge.
Carex anceps Muhl. Two-edged Sedge.
Carex granularis Muhl. Meadow Sedge.
Carex oligocarpa Schk. Few-fruited Sedge.
Carex Hitchcockiana Dewey. Hitchcock's Sedge.
Carex amphibola Steud. Narrow-leaved Sedge.
Carex grisea Wahl. Gray Sedge.
Carex gracillima Schwein. Graceful Sedge.
Carex prasina Wahl. Drooping Sedge.
Carex Davisii Schwein & Torr. Davis' Sedge.
Carex flexuosa Muhl. Slender-stalked Sedge.
Carex arctata Boott. Drooping Wood Sedge.
**Carex Sprengelii* Dewey. Long-beaked Sedge.
Carex Swanii (Fernald) Mackenzie. Swan's Sedge.
Carex virescens Muhl. Ribbed Sedge.
Carex scabrata Schwein. Rough Sedge.
Carex Buxbaumii Wahl. Brown Sedge.
Carex aquatilis Wahl. Water Sedge.
Carex aquatilis var. *cuspidata* Laestad.
Carex crinita Lam. Fringed Sedge.
Carex lacustris Willd. Lake-bank Sedge.
Carex lanuginosa Michx. Woolly Sedge.
Carex lasiocarpa Ehrh. Slender Sedge.
Carex flava L. Yellow Sedge.
Carex folliculata L. Long Sedge.
**Carex Tuckermani* Dewey. Tuckerman's Sedge.
Carex lurida Wahl. Sallow Sedge.
Carex hystricina Muhl. Porcupine Sedge.

Carex
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Carex
Acorus
Spathy
Peltan
Arisaen
Arisaen
Xyris
Juncus
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Juncus
Trades
Luzula
Luzula
Trianth
Uvulan
Allium
Allium
Allium
Lilium
Erythr
Ornith
Musca
Musca
Aspara
**Clinto*
Vagner
Vagner
Unifol
Polygo
Polygo
Medeo
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- Carex comosa* Boott. Bristly Sedge.
Carex intumescens Rudge. Bladder Sedge.
Carex Asa Grayi Bailey. Gray's Sedge.
Carex lupulina Muhl. Hop Sedge.
Acorus Calamus L. Sweet Flag.
Spathyema foetida (L.) Raf. Swamp Cabbage.
Peltandra virginica (L.) Kunth. Green Arrow-arum.
Arisaema triphyllum (L.) Schott. Jack-in the pulpit.
Arisaema Dracontium (L.) Schott. Green Dragon.
Xyris flexuosa Muhl. Slender Yellow-eyed Grass.
Juncus effusus L. Common Rush.
Juncus balticus Willd. var. *littoralis* Engelm. Baltic Rush.
Juncus Dudleyi Wiegand. Dudley's Rush.
Juncus tenuis Willd. Slender Rush.
Juncus alpinus var. *insignis* Fries.
Juncus nodosus L. Knotted Rush.
Juncus Torreyi Coville. Torrey's Rush.
Juncus brachycephalus (Engelm.) Buch. Small-headed Rush.
Juncus canadensis J. Gay. Canada Rush.
Juncus brevicaudatus (Engelm.) Fernald. Narrow-panicled Rush.
Juncus acuminatus Michx. Sharp-fruited Rush.
Tradescantia reflexa Raf. Reflexed Spiderwort.
Luzula intermedia (Thuill.) A. Nels.
Luzula saltuensis Fernald. Hairy Wood-rush.
Triantha glutinosa (Michx.) Baker. Glutinous Triantha.
Uvularia grandiflora J. E. Smith. Large-flowered Bellwort.
Allium tricoccum Ait. Wild Leek.
Allium cernuum Roth. Nodding Wild Onion.
Allium vineale L. Wild Garlic.
Allium canadense L. Meadow Garlic.
Lilium superbum L. Turk's-cap Lily.
Erythronium americanum Ker. Yellow Adder's-tongue.
Ornithogalum umbellatum L. Star-of-Bethlehem.
Muscari botryoides (L.) Mill. Grape-Hyacinth.
Muscari racemosum (L.) Mill. Starch Grape-Hyacinth.
Asparagus officinalis L. Asparagus.
**Clintonia borealis* (Ait.) Raf. Yellow Clintonia.
Vagnera racemosa (L.) Morong. Wild or False Spikenard.
Vagnera stellata (L.) Morong. Star-flowered Solomon's Seal.
Unifolium canadense (Desf.) Greene. Wild Lily-of-the-valley.
Polygonatum biflorum (Walt.) Ell. Hairy Solomon's Seal.
Polygonatum commutatum (R. & S.) Dietr. Smooth Solomon's Seal.
Medeola virginiana L. Indian Cucumber-root.
Trillium sessile L. Sessile-flowered Wake-robin.
Trillium recurvatum Beck. Prairie Wake-robin.
Trillium grandiflorum (Michx.) Salisb. Large-flowered Wake-robin.
Trillium declinatum (A. Gray) Gleason. Drooping Wake-robin.

- Smilax herbacea* L. Carrion-flower.
Smilax ecirrhata (Engelm.) S. Wats. Upright Smilax.
Smilax rotundifolia L. Greenbrier.
Smilax hispida Muhl. Hispid Greenbrier.
Hypoxis hirsuta (L.) Coville. Yellow Star-grass.
Dioscorea villosa L. Wild Yam-root.
Iris versicolor L. Larger Blue-flag.
Sisyrinchium albidum Raf. White Blue-eyed Grass.
Sisyrinchium graminoides Bicknell. Stout Blue-eyed Grass.
Cypripedium reginae Walt. Showy Ladies'-slipper.
Cypripedium candidum Willd. Small White Ladies'-slipper.
Cypripedium parviflorum Salisb. Yellow Ladies'-slipper.
Cypripedium parviflorum var. *pubescens* (Willd.) Knight.
Cypripedium acaule Ait. Moccasin Flower.
Galeorchis spectabilis (L.) Rydb. Showy Orchis.
Coeloglossum bracteatum (Willd.) Parl. Long-bracted Orchis.
Gymnadeniopsis clavellata (Michx.) Rydb. Small Green Wood Orchis.
Limnorchis hyperborea (L.) Rydb. Tall Leafy Green Orchis.
Blephariglottis ciliaris (L.) Rydb. Yellow-fringed Orchis.
Blephariglottis psycodes (L.) Rydb. Purple-fringed Orchis.
Pogonia ophioglossoides (L.) Ker. Rose Pogonia.
Limnorchis tuberosum L. Grass-pink.
Ibidium cernuum (L.) House. Nodding Ladies'tresses.
Peramium pubescens (Willd.) MacM. Downy Rattlesnake Plantain.
**Malaxis unifolia* Michx. Green Adder's-mouth.
Liparis Loeselii (L.) L. C. Rich. Fen Orchis.
Aplectrum hyemale (Muhl.) Torr. Adam-and-Eve.
Corallorrhiza maculata Raf. Large Coral-root.
Saururus cernuus L. Lizard's-tail.
Populus alba L. Silver Poplar.
Populus candicans Ait. Balm of Giliad.
Populus grandidentata Michx. Large-toothed Aspen.
Populus tremuloides Michx. American Aspen.
Populus italica Moench. Lombardy Poplar.
Populus deltoides Marsh. Cottonwood.
Salix amygdaloides Anders. Peach-leaved Willow.
Salix fragilis L. Crack Willow.
Salix interior Rowlee. Sandbar Willow.
Salix glaucophylla Bebb. Broad-leaved Willow.
Salix alba var. *vitellina* (L.) Koch.
Salix adenophylla Hook. Furry Willow.
Salix discolor Muhl. Pussy Willow.
Salix humilis Marsh. Prairie Willow.
Juglans nigra L. Black Walnut.
Juglans cinerea L. Butternut.
Hicoria cordiformis (Wang.) Britton. Bitter-nut.
Hicoria ovata (Mill.) Britton. Shag-bark.

Carpin
 Ostrya
 Betula
 Betula
 Alnus
 Fagus
 Quercus
 Quercus
 Quercus
 Quercus
 Quercus
 Ulmus
 Ulmus
 Celtis
 Morus
 Canna
 Urtica
 Urtica
 Pilea
 Boehm
 Coman
 Asarum
 Aristol
 Rumex
 Rumex
 Rumex
 Rumex
 Rumex
 Persica
 Persica
 Polygo
 Tovar
 Tracau
 Tracau
 Tinia
 Tinia
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 Chenop
 Cyclol
 Corisp
 Salsola
 Amara
 Amara
 Allioni
 Mollug
 Clayton

Carpinus caroliniana Walt. American Hornbeam.
Ostrya virginiana (Mill.) Willd. Hop-hornbeam.
Betula nigra L. River Birch.
Betula lutea Michx. f. Yellow Birch.
Alnus incana (L.) Willd. Speckled Alder.
Fagus grandifolia Ehrh. American Beech.
Quercus rubra L. Red Oak.
Quercus velutina Lam. Black Oak.
Quercus marilandica Muench. Black-Jack Oak.
Quercus alba L. White Oak.
Quercus bicolor Willd. Swamp White Oak.
Quercus Michauxii Nutt. Cow Oak.
Ulmus americana L. American Elm.
Ulmus fulva Michx. Slippery Elm.
Celtis occidentalis L. Hackberry.
Morus rubra L. Red Mulberry.
Cannabis sativa L. Hemp.
Urtica Lyallii Wats.
Urticastrum divaricatum (L.) Kuntze. Wood Nettle.
Pilea pumila (L.) A. Gray. Clearweed.
Boehmeria cylindrica (L.) Sw. False Nettle.
Comandra umbellata (L.) Nutt. Bastard Toad-flax.
Asarum canadense L. Wild Ginger.
Aristolochia Serpentina L. Virginia Snakeroot.
Rumex Acetosella L. Field or Sheep Sorrell.
Rumex verticillatus L. Swamp Dock.
Rumex Britannica L. Great Water-Dock.
Rumex crispus L. Curled Dock.
Rumex obtusifolius L. Broad-leaved Dock.
Persicaria Careyi (Olney) Greene. Carey's Persicaria.
Persicaria lapathifolia (L.) S. F. Gray. Dock-leaved Persicaria.
Polygonum tenue Michx. Slender Knotweed.
Tovara virginiana (L.) Raf. Virginia Knotweed.
Tracaulon sagittatum (L.) Small. Arrow-leaved Tear-thumb.
Tracaulon arifolium (L.) Raf. Halberd-leaved Tear-thumb.
Tinaria Convolvulus (L.) Webb & Moq. Black Bindweed.
Tinaria cilimodis (Michx.) Small. Fringed Black Bindweed.
Chenopodium album L. Lamb's Quarters.
Chenopodium ambrosioides L. Mexican Tea.
Cycloloma atriplicifolium (Spreng.) Coult. Winged Pigweed.
Corispermum hyssopifolium L. Bug-seed.
Salsola pestifer A. Nelson. Russian Thistle.
Amaranthus blitoides S. Wats. Prostrate Amaranth.
Amaranthus graecizans L. Tumble-weed.
Allionia nyctaginea Michx. Heart-leaved Umbrella-wort.
Mollugo verticillata L. Carpet-weed.
Claytonia virginica L. Spring Beauty.

Cerastium vulgatum L. Spring Beauty.
Cerastium arvense L. Field Chickweed.
Alsine media L. Common Chickweed.
Alsine longifolia (Muhl.) Britton. Long-leaved Stitchwort.
Alsine graminea (L.) Britton. Lesser Stitchwort.
Arenaria serpyllifolia L. Thyme-leaved Sandwort.
Moehringia laterifolia (L.) B.S.P. Slender Forked Chickweed.
Anychia canadensis (L.) B.S.P. Slender Forked Chickweed.
Scleranthus annuus L. Knawel.
Agrostemma Githago L. Corn Cockle.
Silene stellata (L.) Ait. Starry Campion.
Silene antirrhina L. Sleepy Catchfly.
Lychnis alba Mill. White Campion.
Lychnis Coronaria (L.) Desr. Mullein Pink.
Dianthus barbatus L. Sweet William.
Saponaria officinalis L. Soapwort.
**Nelumbo lutea* (Willd.) Pers. American Lotus.
Nymphaea advena Soland. Large Yellow Pond Lily.
Castalia tuberosa (Paine) Greene. Tuberous White Water Lily.
Caltha palustris L. Marsh-marigold.
Ioppyrum biternatum (Raf.) T. & G. False Rue Anemone.
Coptis trifolia (L.) Salisb. Gold-thread.
Actaea alba (L.) Mill. White Baneberry.
Aquilegia canadensis L. Wild Columbine.
Aquilegia vulgaris L. European Columbine.
Anemone virginiana L. Tall Anemone.
Anemone canadensis L. Canada Anemone.
Anemone quinquefolia L. Wind-flower.
Hepatica triloba Chaix. Round-lobed Liver-leaf.
Hepatica acutiloba DC. Sharp-lobed Liver-leaf.
Syndesmon thalictroides (L.) Hoffmg. Rue-Anemone.
Clematis virginiana (L.) Virgin's Bower.
Batrachium circinatum (Sibth.) Rehb. Stiff White Water-Crowfoot.
Ranunculus delphinifolius Torr. Yellow Water-Crowfoot.
Ranunculus delphinifolius var. *terrestris* (Gray) Farwell.
Ranunculus abortivus L. Kidney-leaved Crowfoot.
Ranunculus sceleratus L. Celery-leaved Crowfoot.
Ranunculus recurvatus Poir. Hooked Crowfoot.
Ranunculus acris L. Tall Meadow Buttercup.
Ranunculus septentrionalis Poir. Swamp Buttercup.
Ranunculus hispidus Michx. Hispid Buttercup.
Ranunculus fascicularis Muhl. Tufted Buttercup.
Thalictrum dasycarpum Fisch. & Lall. Purplish Meadow-Rue.
Thalictrum dioicum L. Early Meadow-Rue.
Thalictrum canadense Mill.
Podophyllum peltatum L. May Apple.
Caulophyllum thalictroides (L.) Michx. Blue Cohosh.

Berber
 Menis
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 Sassafr
 Benzo
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 Stylop
 Chelid
 Papave
 Bicucul
 Bicucul
 *Adlun
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 Barbare
 Radicul
 Radicul
 Sisymb
 Roripa
 Cardam
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 Dentari
 Dentari
 Capsell
 Camelin
 Draba
 Draba
 Arabid
 Arabis
 Arabis
 Arabis
 Arabis
 Arabis
 Alyssun
 Hesper
 Polanis
 Sarracer
 Drosera

- Berberis vulgaris* L. European Barberry.
Menispermum canadense L. Canada Moonseed.
Liriodendron Tulipifera L. Tulip-tree.
Asimina triloba (L.) Dunal. North American Papaw.
Sassafras variifolium Kuntze. Sassafras.
Benzoin aestivale (L.) Nees. Spice-bush.
Sanguinaria canadensis L. Bloodroot.
Stylophorum diphyllum (Michx.) Nutt. Celandine Poppy.
Chelidonium maius L. Celandine.
Papaver Rhoeas L. Corn Poppy.
Bicuculla Cucullaria (L.) Misp. Dutchman's Breeches.
Bicuculla canadensis (Goldie) Millsp. Squirrel Corn.
**Adlumia fungosa* (Ait.) Greene. Climbing Fumitory.
Lepidium campestre (L.) R. Br. Field Cress.
Lepidium virginicum L. Wild Pepper-grass.
Thlaspi arvense L. Field Penny-cress.
Erysimum officinale L. Hedge Weed.
Norta altissima (L.) Britton. Tall Sisymbrium.
Cakile edentula (Bigel.) Hook. American Sea Rocket.
Brassica nigra (L.) Koch. Black Mustard.
Brassica juncea (L.) Cosson. Indian Mustard.
Brassica campestris L. Turnip.
Barbarea stricta Andr. Erect-fruited Winter Cress.
Radicula sylvestris (L.) Druce. Creeping Yellow Water-cress.
Radicula hispida (Des.) Britton. Hispid Yellow-cress.
Sisymbrium Nasturtium-aquaticum L. True Water-cress.
Roripa Armoracia (L.) Britton. Horse-radish.
Cardamine pennsylvanica Muhl. Pennsylvania Bitter-cress.
Cardamine Douglassii (Torr.) Britton. Purple Cress.
Cardamine bulbosa (Schreb.) B.S.P. Bulbous Cress.
Dentaria laciniata Muhl. Cult-leaved Toothwort.
Dentaria diphylla Michx. Two-leaved Toothwort.
Capsella Bursa-pastoris (L.) Medic. Shepherd's-purse.
Camelina microcarpa Andr. Small-fruited False-flax.
Draba verna L. Vernal Whitlow-grass.
Draba caroliniana Walt. Carolina Whitlow-grass.
Arabidopsis Thaliana (L.) Britton. Mouse-ear or Thale-cress.
Arabis lyrata L. Lyre-leaved Rock-cress.
Arabis glabra (L.) Bernh. Tower Mustard.
Arabis laevigata (Muhl.) Poir. Smooth Rock-cress.
Arabis canadensis L. Sickie-pod.
Arabis Drummondii A. Gray. Drummond's Rock-cress.
Alyssum alyssoides L. Yellow or Small Alyssum.
Hesperis matronalis L. Dame's Rocket or Dame's Violet.
Polanisia graveolens Raf. Clammy-weed.
Sarracenia purpurea L. Pitcher-plant.
Drosera rotundifolia L. Round-leaved Sundew.

Sedum triphyllum (Haw.) S. F. Gray. Orpine. Live-forever.
Penthorum sedoides L. Ditch or Virginia Stonecrop.
Micranthes pennsylvanica (L.) Haw. Pennsylvania Saxifrage.
Heuchera hirsuticaulis (Wheelock) Rydb. Rough-stemmed Heuchera.
Mitella diphylla L. Two-leaved Bishop's Cap.
 **Mitella nuda* L. Naked Bishop's Cap.
Chrysosplenium americanum Schwein. Golden Saxifrage.
Grossularia Cynosbati (L.) Mill. Wild Gooseberry.
Ribes americanum Mill. Wild Black Currant.
Ribes odoratum Wendl. Golden Currant.
Hamamelis virginiana L. Witch-Hazel.
Platanus occidentalis L. Sycamore. Button-wood.
Opulaster opulifolius (L.) Kuntze. Ninebark.
Spiraea alba DuRoi. Narrow-leaved Meadow-sweet.
Spiraea tomentosa L. Hardhack. Steeple-bush.
Aronia arbutifolia (L.) Ell. Red Choke-berry.
Aronia atropurpurea Britton. Purple-fruited Choke-berry.
Malus glaucescens Rehder. American Crab Apple.
Malus sylvestris Mill. Apple.
Amelanchier canadensis (L.) Medic. June-berry. Service-berry.
Crataegus cuneiformis (Marsh.) Eggleston. Marshall's Thorn.
Crataegus punctata Jacq. Large-fruited Thorn.
Rubus occidentalis L. Black Raspberry.
Rubus triflorus Richards. Dwarf Red Blackberry.
Rubus frondosus Bigel. Leafy-flowered Blackberry.
Rubus alleghaniensis Porter. Mountain Blackberry.
Rubus procumbens Muhl. Dewberry.
Rubus hispidus L. Hispid Swamp Blackberry.
Fragaria virginiana Duchesne. Virginia Strawberry.
Comarum palustre L. Purple or Marsh Cinquefoil.
Argentina Anserina (L.) Rydb. Silver-weed.
Potentilla canadensis L. Common Cinquefoil.
Potentilla monspeliensis L. Rough Cinquefoil.
Potentilla argentea L. Silvery Cinquefoil.
Potentilla recta L. Rough-fruited Cinquefoil.
Geum virginianum L. Rough Avens.
Geum canadense Jacq. White Avens.
Geum strictum Ait. Yellow Avens.
Agrimonia gryposepala Wallr. Tall Hairy Agrimony.
Rosa setigera Michx. Prairie Rose.
Rosa carolina L. Swamp or Wild Rose.
Rosa virginiana Mill. Low or Pasture Rose.
Prunus americana Marsh. Wild Yellow or Red Plum.
Prunus pumila L. Sand or Dwarf Cherry.
Prunus pennsylvanica L. f. Wild Red or Pigeon Cherry.
Prunus virginiana L. Choke Cherry.
Cercis canadensis L. Red-bud. American Judas-tree.

Gledits
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Polygal
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Chama
Chama

- Gleditsia triacanthos* L. Honey Locust.
Baptisia leucantha T. & G. Large White Wild Indigo.
Lupinus perennis L. Wild or Perennial Lupine.
Medicago sativa L. Purple Medic.
Medicago lupulina L. Black or Hop Medic.
Melilotus alba Desv. White Melilot.
Melilotus officinalis (L.) Lam. Yellow Melilot.
Trifolium agrarium L. Yellow or Hop-clover.
Trifolium procumbens L. Low Hop-clover.
Trifolium arvense L. Rabbit-foot Clover.
Trifolium pratense L. Red or Meadow Clover.
Trifolium hybridum L. Alsike or Alsatian Clover.
Robinia Pseudo-Acacia L. Locust-tree.
 **Robinia hispida* L. Rose Acacia.
Meibomia grandiflora (Walt.) Kuntze. Pointed-leaved Tick-trefoil.
Meibomia Michauxii Vail. Prostrate Tick-trefoil.
Meibomia canadensis (L.) Kuntze. Canadian Tick-trefoil.
Lespedeza frutescens (L.) Britton. Wand-like Bush-clover.
Lespedeza hirta (L.) Hornem. Hairy Bush-clover.
Lespedeza capitata Michx. Round-headed Bush-clover.
Vicia villosa Roth. Winter Vetch.
Vicia americana Muhl. American or Purple Vetch.
Lathyrus maritimus (L.) Bigel. Beach Pea.
Lathyrus palustris L. Marsh Vetchling. Wild Pea.
Lathyrus myrtifolius Muhl. Myrtle-leaved Marsh Pea.
Falcata comosa (L.) Kuntze. Wild or Hog Pea-nut.
Glycine Apios L. Ground-nut.
Strophostyles helvola (L.) Britton. Trailing Wild Bean.
Geranium maculatum L. Spotted Crane's-bill.
 **Geranium rotundifolium* L. Round-leaved Crane's-bill.
Geranium carolinianum L. Carolina Crane's-bill.
Robertiella Robertiana (L.) Hanks. Herb Robert.
Erodium cicutarium (L.) L'Her. Hemlock Stork's-bill.
Xanthoxalis stricta (L.) Small. Wood-sorrel.
Ionoxalis violacea (L.) Small. Violet Wood-sorrel.
Cathartolinum striatum (Walt.) Small. Rigid Yellow Flax.
Zanthoxylum americanum Mill. Prickly Ash.
Ptelea trifoliata L. Three-leaved Hop-tree.
Celastrus scandens L. Shrubby or Climbing Bittersweet.
Polygala verticillata L. Whorled Milk-wort.
Polygala viridescens L. Field or Purple Milkwort.
Plygala Senega L. Seneca Snakeroot.
Polygala polygama Walt. Racemed Milkwort.
Acalypha virginica L. Mercury-weed.
Chamaesyce polygonifolia (L.) Small. Seaside Spurge.
Chamaesyce humistrata (Engelm.) Small. Hairy Spreading Spurge.
Chamaesyce maculata (L.) Small. Spotted or Blotched Spurge.

Chamaesyce Preslii (Guss.) Arthur. Upright Spotted Spurge.
Tithymalopsis corollata (L.) Kl. & Garcke. Flowering Spurge.
Tithymalus Cyparissias (L.) Hill. Cypress Spurge.
Tithymalus commutatus (Engelm.) Kl. and Garcke. Tinted Spurge.
Floerkea proserpinacoides Willd. False Mermaid.
Rhus copallina L. Dwarf Sumac.
Rhus hirta (L.) Sudw. Staghorn Sumac.
Rhus glabra L. Smooth Sumac.
Ilex verticillata (L.) A. Gray. Winterberry. Black Alder.
Nemopanthes mucronata (L.) Trelease. Wild or Mountain Holly.
Euonymus obovatus Nutt. Running Strawberry Bush.
Staphylea trifolia L. American Bladder-nut.
Acer saccharinum L. Silver Maple.
Acer rubrum L. Red Maple.
Acer saccharum Marsh. Sugar Maple.
Acer nigrum Michx. Black Sugar Maple.
Acer Negundo L. Box Elder.
Aesculus glabra Willd. Fetid Buckeye. Ohio Buckeye.
Impatiens pallida Nutt. Pale Touch-me-not.
Rhamnus alnifolia L'Her. Alder-leaved Buckthorn.
Ceanothus americanus L. New Jersey Tea.
Vitis vulpina L. Riverside Grape.
Parthenocissus quinquefolia (L.) Planch. Virginia Creeper.
Tilia americana L. Basswood. American Linden.
Abutilon Theophrasti Medic. Velvet Leaf.
Malva rotundifolia L. Low Mallow.
Hypericum Kalmianum L. Kalm's St. John's-wort.
Hypericum prolificum L. Shrubby St. John's-wort.
Hypericum perforatum L. Common St. John's-wort.
Hypericum punctatum Lam. Spotted St. John's-wort.
Hypericum mutilum L. Dwarf St. John's-wort.
Hypericum canadense L. Canada St. John's-wort.
Triadenum virginicum (L.) Raf. Marsh St. John's-wort.
Crocanthemum canadense (L.) Britton. Rock-rose. Frostweed.
Lechea villosa Ell. Hairy Pinweed.
Viola pedata L. Bird's-foot Violet.
Viola papilionacea Pursh. Meadow Blue Violet.
Viola sororia Willd. Woolly Blue Violet.
Viola cucullata Ait. Marsh Blue Violet.
Viola blanda Willd. Sweet White Violet.
Viola pallens (Banks) Brainerd. Northern White Violet.
Viola lanceolata L. Lance-leaved Violet.
Viola eriocarpa Schwein. Smoothish Yellow Violet.
Viola pubescens Ait. Downy Yellow Violet.
Viola canadensis L. Canada Violet.
Viola striata Ait. Striped Violet.
Viola conspersa Reichenb. American Dog Violet.

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- Viola rostrata* Pursh. Long-spurred Violet.
Viola tricolor L. Pansy.
Viola arvensis Murray. European Field Pansy.
Cubelium concolor (Forst.) Raf. Green Violet.
Dirca palustris L. Leather-wood. Moose-wood.
**Lepargyrea canadensis* (L.) Greene. Canadian Buffalo-berry.
Lythrum alatum Pursh. Wing-angled Loosestrife.
Decodon verticillatus (L.) Ell. Swamp Loosestrife.
Isnardia palustris L. Marsh Purslane.
Oenothera biennis L. Common Evening-Primrose.
Raimannia laciniata (Hill) Rose. Cut-leaved Evening-Primrose.
Circaea lutetiana L. Enchanter's Nightshade.
Miriophyllum spicatum L. Spiked Water-Milfoil.
Miriophyllum verticillatum L. Whorled Water-Milfoil.
Proserpinaca palustris L. Mermaid-weed.
Aralia racemosa L. American Spikenard.
Aralia nudicaulis L. Wild Sarsaparilla.
Panax quinquefolium L. Ginseng.
Panax trifolium L. Dwarf Ginseng.
Hydrocotyle umbellata L.
Sanicula gregaria Bicknell. Clustered Snake-root.
Sanicula trifoliata Bicknell. Large-fruited Snake-root.
Chaerophyllum procumbens (L.) Crantz. Spreading Chervil.
Washingtonia Claytoni (Michx.) Britton. Hairy Sweet-Cicely.
**Washingtonia longistylis* (Torr.) Britton. Smooth Sweet-Cicely.
Erigenia bulbosa (Michx.) Nutt. Harbinger of Spring.
Epilobium adenocaulon Haussk. Northern Willow-herb.
Chamaenerion angustifolium (L.) Scop. Great Willow-herb.
Cicuta maculata L. Water Hemlock.
Cicuta bulbifera L. Bulb-bearing Water Hemlock.
Deringa canadensis (L.) Kuntze. Honewort.
Taenidia integerrima (L.) Drude. Yellow Pimpernel.
Thaspium trifoliatum (L.) Britton. Purple Meadow-Parsnip.
Thaspium barbinode (Michx.) Nitt. Hair-jointed Meadow-Parsnip.
Thaspium pinnatifidum (Buckl.) A. Gray. Cut-leaved Meadow-Parsnip.
Zizia aurea (L.) Koch. Golden Meadow-Parsnip.
Oxypolis rigidius (L.) Raf. Cowbane.
Heracleum lanatum Michx. Cow-Parsnip.
Daucus Carota L. Wild Carrot.
Cornus rugosa Lam. Round-leaved Dogwood.
Cornus obliqua Raf.
Cornus stolonifera Michx. Red-osier Dogwood.
Cornus alternifolia L.f. Alternate-leaved Dogwood.
Cynoxylon floridum (L.) Raf. Flowering Dogwood.
Chamaepericlymenum canadense (L.) Asch. & Graebn. Dwarf Cornel.
**Chimaphila maculata* (L.) Pursh. Spotted Wintergreen.
Chimaphila umbellata (L.) Nutt. Pipsissewa.

Pyrola americana Sweet. Round-leaved American Wintergreen.
Pyrola elliptica Nutt. Shin-leaf.
Monotropa uniflora L. Indian Pipe.
Chamaedaphne calyculata (L.) Moench. Leather-leaf.
Epigaea repens L. Trailing Arbutus.
Gaultheria procumbens L. Spicy Wintergreen.
Arctostaphylos Uva-ursi (L.) Spreng. Red Bearberry.
Vaccinium corymbosum L. High-bush Blueberry.
Vaccinium pennsylvanicum Lam. Low-bush Blueberry.
Vaccinium vacillans Kalm. Low Blueberry.
Gaylussacia baccata (Wang.) K. Koch. Black Huckleberry.
Oxycoccus macrocarpus (Ait.) Pursh. American Cranberry.
 **Androsace occidentalis* Pursh. Androsace.
Lysimachia terrestris (L.) B.S.P. Bulb-bearing Loosestrife.
Lysimachia Nummularia L. Money-wort.
Steironema ciliatum (L.) Raf. Fringed Loosestrife.
Steironema lanceolatum (Walt.) A. Gray. Lance-leaved Loosestrife.
Steironema quadriflorum (Sims) Hitchc. Prairie Money-wort.
Naumburgia thyrsiflora (L.) Duby. Tufted Loosestrife.
Trientalis americana Pursh. Star-flower.
Samolus floribundus H.B.K. Water Pimpernel.
Dodecatheon Meadia L. Shooting Star.
Fraxinus americana L. White Ash.
Fraxinus pennsylvanica Marsh. Gray Ash.
Fraxinus quadrangulata Michx. Blue Ash.
Syringa vulgaris L. Lilac.
Sabbatia angularis (L.) Pursh. Rose-Pink. Rose Gentian.
Bartonia virginica (L.) B.S.P. Yellow Bartonia.
Gentiana quinquefolia L. Stiff Gentian.
Gentiana clausa Raf. Closed or Bottle Gentian.
Frasera carolinensis Walt. American Columbo.
Menyanthes trifoliata L. Buckbean.
Vinca minor L. Creeping Myrtle.
Apocynum androsaemifolium L. Spreading Dogbane.
Asclepias tuberosa L. Butterfly-weed.
Asclepias incarnata L. Swamp Milkweed.
Asclepias amplexicaulis J. E. Smith. Blunt-leaved Milkweed.
Asclepias exaltata (L.) Muhl. Tall Milkweed.
Asclepias syriaca L. Common Milkweed.
Acerates viridiflora (Raf.) Eaton. Green Milkweed.
Convolvulus sepium L. Hedge Bindweed.
Phlox paniculata L. Garden Phlox.
Phlox maculata L. Wild Sweet-William.
Phlox pilosa L. Downy Phlox.
Phlox divaricata L. Wild Blue Phlox.
Phlox subulata L. Ground Pink.
Polemonium reptans L. Greek Valerian.

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- Hydrophyllum virginianum* L. Virginia Water-leaf.
Hydrophyllum appendiculatum Michx. Appendaged Water-leaf.
**Hydrophyllum canadense* L. Broadleaved Water-leaf.
Cynoglossum officinale L. Hound's Tongue.
Lappula virginiana (L.) Greene. Virginia Stickseed.
Myosotis scorpioides L. Forget-me-not.
Lithospermum arvense L. Corn Gromwell.
Lithospermum carolinense (Walt.) Macm. Hairy Puccoon.
Lithospermum canescens (Michx.) Lehm. Hoary Puccoon.
Verbena urticifolia L. White or Nettle-leaved Vervain.
**Verbena canadensis* (L.) Britton. Large-flowered Verbena.
Teucrium canadense L. Wood Sage. American Germander.
Teucrium occidentale A. Gray. Hairy Germander.
Scutellaria pilosa Michx. Hairy Skullcap.
Scutellaria parvula Michx. Small Skullcap.
Scutellaria galericulata L. Marsh Skullcap.
Marrubium vulgare L. Common Hoarhound.
Nepeta Cataria L. Catnip.
Glechoma hederacea L. Ground Ivy.
Prunella vulgaris L. Self-heal.
Lamium amplexicaule L. Henbit.
Lamium purpureum L. Red Dead Nettle.
Stachys aspera Michx. Rough Hedge Nettle.
Monarda fistulosa L. Wild Bergamot.
Monarda punctata L. Horse-mint.
Blephilia ciliata (L.) Raf. Downy Blephilia.
Blephilia hirsuta (Pursh) Torr. Hairy Blephilia.
Hedeoma pulegioides (L.) Pers. American Pennyroyal.
**Hedeoma hispida* Pursh. Rough Pennyroyal.
**Clinopodium vulgare* L. Field Basil.
Koellia virginiana (L.) MacM. Mountain Mint.
Physalis virginiana Mill. Virginia Ground-Cherry.
Physalis heterophylla Nees. Clammy Ground-Cherry.
Solanum Dulcamara L. Climbing Nightshade.
Verbascum Thapsus L. Great Mullen.
Verbascum Blattaria L. Moth Mullen.
Linaria vulgaris Hill. Butter-and-Eggs.
Linaria canadensis (L.) Dumort. Blue Toad-Flax.
**Collinsia verna* Nutt. Blue-eyed Mary.
Chelone glabra L. Snake-head.
Scrophularia leporella Bicknell. Hare Figwort.
Penstemon hirsutus (L.) Willd. Hairy Beard-tongue.
Penstemon laevigatus Ait.
Mimulus ringens L. Square-stemmed Monkey-flower.
Veronica glandulifera Pennell. Water Speedwell.
Veronica officinalis L. Common Speedwell.
Veronica serpyllifolia L. Thyme-leaved Speedwell.

- Veronica peregrina* L. Purslane Speedwell.
Veronica arvensis L. Corn Speedwell.
Agalinis tenuifolia (Vahl.) Raf. Slender Agalinis.
Azelia macrophylla (Nutt.) Kuntze. Mullen Foxglove.
Dasystoma flava (L.) Wood. Downy False Foxglove.
Dasystoma grandiflora (Benth.) Wood. Western False Foxglove.
Dasystoma virginica (L.) Britton. Smooth False Foxglove.
Castilleja coccinea (L.) Spreng. Indian Paint-brush.
Pedicularis lanceolata Michx. Swamp Betony.
Pedicularis canadensis L. Wood Betony.
Leptamnium virginianum (L.) Raf. Beech-drops.
 **Utricularia gibba* L. Spurred Bladderwort.
Utricularia intermedia Hayne. Flat-leaved Bladderwort.
Utricularia macrorhiza LeConte. Greater Bladderwort.
Phryma leptostachya L. Lopseed.
Plantago Rugelii Dcne. Pale Plantain.
Plantago lanceolata L. Ribwort. Lance-leaved Plantain.
Plantago aristata Michx. Large-bracted Plantain.
Plantago virginica L. Dwarf Plantain.
Cephalanthus occidentalis L. Button-bush.
Mitchella repens L. Partridge-berry. Twin-berry.
Galium Aparine L. Cleavers.
Galium pilosum Ait. Hairy Bed-straw.
Galium circaezans Michx. Wild Liqueurice.
Galium boreale L. Northern Bed-straw.
Galium triflorum Michx. Fragrant Bed-straw.
Galium tinctorium L. Stiff Marsh Bed-straw.
Galium Claytoni Michx. Clayton's Bed-straw.
Galium concinnum Torr. & Gray. Shining Bed-straw.
Sambucus canadensis L. Common Elder.
Sambucus racemosa L. Red-berried Elder.
Viburnum acerifolium L. Maple-leaved Arrow-wood.
Viburnum affine Bush.
Viburnum Lentago L. Sweet Viburnum.
Symphoricarpos racemosus Michx. Snowberry.
 **Linnaea americana* Forbes. Twin-flower.
Lonicera glaucescens Rydb. Douglas' Honeysuckle.
Lonicera dioica L. Smooth-leaved Honeysuckle.
Lonicera canadensis Marsh. American Fly-honeysuckle.
Lonicera Xylosteum L. Fly-Honeysuckle.
Lonicera Diervilla L. Bush-Honeysuckle.
Valerianella Locusta (L.) Bettke. European Corn Salad.
Valeriana edulis Nutt. Edible Valerian.
Valeriana officinalis L. Common Valerian.
Micrampelis lobata (Michx.) Greene. Wild Balsam Apple.
Campanula rotundifolia L. Harebell.
Campanula aparinoides Pursh. Marsh Bellflower.

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- Campanula uliginosa* Rydb. Blue Marsh Bellflower.
Campanula americana L. Tall Bellflower.
Specularia perfoliata (L.) A. DC. Venus' Looking-glass.
Lobelia cardinalis L. Cardinal-flower.
Lobelia syphilitica L. Great Lobelia.
Lobelia Kalmii L. Kalm's Lobelia.
Eupatorium purpureum L. Purple Boneset.
Lacinaria scariosa (L.) Hill. Large Button-Snakeroot.
Lacinaria spicata (L.) Kuntze. Dense Button-Snakeroot.
Solidago caesia L. Blue-stemmed Golden-rod.
Solidago Gillmani (A. Gray) Steele. Gillman's Golden-rod.
Solidago ulmifolia Muhl. Elm-leaved Golden-rod.
Solidago canadensis L. Canada Golden-rod.
Solidago altissima L. Tall Golden-rod.
Aster novae-angliae L. New England Aster.
Aster laevis L. Smooth Aster.
Aster juncus Ait. Rush. Aster.
Aster lateriflorus (L.) Britton. Starved Aster.
Aster vimineus Lam. Small White Aster.
Erigeron pulchellus Michx. Robin's Plantain.
Erigeron philadelphicus L. Fleabane.
Antennaria fallax Greene.
Antennaria Parlinii Fernald. Parlin's Cat's-foot.
Antennaria plantaginifolia (L.) Richards. Plantain-leaf Everlasting.
Antennaria neodioca Greene. Smaller Cat's-foot.
Antennaria neglecta Greene. Field Cat's-foot.
Gnaphalium polycephalum Michx. Common Everlasting.
Inula Helenium L. Elecampane.
Silphium integrifolium Michx. Entire-leaved Rosin-weed.
Silphium terebinthinaceum Jacq. Prairie Dock.
**Polymnia canadensis* L. Small-flowered Leaf-cup.
Heliopsis scabra Dunal. Rough Ox-eye.
Ratibida pinnata (Vent.) Barnhart. Gray-headed Cone-flower.
Rudbeckia hirta L. Black-Eyed Susan.
Rudbeckia speciosa Wenderoth. Showy Cone-flower.
Rudbeckia laciniata L. Tall Cone-flower.
Helianthus illinoensis Gleason.
Helianthus grosse-serratus Martens. Saw-tooth Sunflower.
Helianthus divaricatus L. Woodland Sunflower.
Helianthus decapetalus L. Thin-leaved Sunflower.
Helianthus strumosus L. Pale-leaved Wood Sunflower.
Coreopsis grandiflora Hogg. Large-flowered Tickseed.
Coreopsis tripteris L. Tall Tickseed.
Coreopsis palmata Nutt. Stiff Tickseed.
Bidens cernua L. Nodding Bur-Marigold.
Galinsoga parviflora Cav. Galinsoga.
Helenium autumnale L. Swamp Sunflower.

- Achillea Millefolium* L. Yarrow.
Matricaria matricarioides (Less.) Porter. Rayless Camomile.
Chrysanthemum Leucanthemum L. Ox-eye Daisy.
Tanacetum vulgare L. Tansy.
Artemisia canadensis Michx. Canada Worm-wood.
Mesadenia atriplicifolia (L.) Raf. Pale Indian Plantain.
Mesadenia tuberosa (Nutt.) Britton. Tuberous Indian Plantain.
Senecio aureus L. Golden Ragwort.
Senecio obovatus Muhl. Round-leaf Squaw-weed.
Senecio Balsamitae Muhl. Groundsel.
Cirsium lanceolatum (L.) Hill. Common Bur or Spear Thistle.
Cirsium discolor (Muhl.) Spreng. Field Thistle.
Cirsium Pitcheri (Torr.) T. & G. Pitcher's Thistle.
Cirsium pumilum (Nutt.) Spreng. Bull or Pasture Thistle.
Cirsium arvense (L.) Scop. Canada Thistle.
Cichorium Intybus L. Chicory.
Krigia virginica (L.) Willd. Dwarf Dandelion.
Krigia biflora (Walt.) Blake. False Dandelion.
Leontodon Taraxacum L. Dandelion.
Leontodon erythrospermum (Andrz.) Britton. Red-seeded Dandelion.
Tragopogon pratensis L. Yellow Goat's-beard.
Tragopogon porrifolius L. Purple Goat's-beard.
Sonchus asper (L.) Hill. Spiny Sow-Thistle.
Lactuca virosa L. Prickly Lettuce.
Lactuca canadensis L. Wild Lettuce.
Lactuca spicata (Lam.) Hitchc. Tall Blue Lettuce.
Nabalus albus (L.) Hook. Rattlesnake-root.
Nabalus racemosus (Michx.) DC. Glauous White-lettuce.
Hieracium longipilum Torr. Long-bearded Hawkweed.
Hieracium scabrum Michx. Rough Hawkweed.
Hieracium Gronovii L. Hairy Hawkweed.

NOTRE DAME, IND.

THE ANATOMY OF *RANUNCULUS ASIATICUS* L. VAR. *SUPERBISSIMUS* (HORT.)

SR. CRESCENTIA GIER SCH, S.S.J.

Introduction

A study of root-stem transition in the Angiosperm seedling involves the tracing of developing xylem and phloem elements from the radial root arrangement to the level where the endarch collateral bundle occurs. In *Ranunculus asiaticus* L. var. *superbissimus* (Hort.) the gradual development of xylem and phloem has been followed from the root tip to the base of the cotyledonary petiole where the endarch collateral bundle is first observed. Further investigation has been made to determine the relation of plumular development to the primary axis.

The seedlings used in this study were selected according to the development of foliage leaves. In the youngest seedling investigated the first foliage leaf was enclosed within the cotyledonary tube. In the oldest seedling described the plumular connections with the primary axis had been made. Various levels have been studied in relation to comparative levels of successively older seedlings.

Transition anatomy has been investigated chiefly from three points of view. Sterchx (1897), Nihoul (1892), Lenfant (1897) and others have considered it mainly from a purely anatomical aspect; Sargent (1900) and Thomas (1907) have investigated it as a possible basis for phylogenetic work; Hill and DeFraine (1913) and Bodmer (1928) suggest that physiological factors have a direct bearing upon vascular continuity. Very recently Scott and Sharsmith (1933) interpreted transition in *Ricinus communis* L. entirely from a physiological standpoint concluding that xylem and phloem develop in relation to the paths of food and water condition.

Conflicting theories have arisen in regard to the manner in which transition is accomplished. Van Tieghem (1891) and Gerard (1881) interpreted it as a passage brought about by divisions, twistings, and rotation of the elements. Opposed to Van Tieghem and Gerard is the interpretation of Sterchx (1900). He considered the plant as made up of distinct morphological units and as such each unit had its own vascular elements. There were, then, special root bundles, stem bundles, and leaf traces which were brought into contact with one another by means of smaller tracheae so as to establish a continuous vascular system.

As late as 1911 Chauveaud denied Gerard's theory of passage and
(343)

stated that what seems to be a division and rotation of the vascular elements is, in reality, the successive suppression of older elements and the appearance of new elements. Gravis (1919) supported Chauveaud and supplied the phrase "anatomical connections" for "passage." According to his interpretation the vascular strands of root and stem are connected (in young plants) by means of special groups of cells called "triads." A triad is composed of a small group of centripetal protoxylem situated between the halves of a typical collateral bundle. Tronchet (1930) who follows Chauveaud's interpretation of vascular development rejects Gravis' theory of "anatomical connections." Lenoir (1919), too, concluded that there is no division or resolution of the vascular elements but an inversion due to mechanical influences which the xylem and phloem elements undergo in their continuity from root to stem.

Today few investigators of transition anatomy accept Van Tieghem's and Gerard's interpretation of transition. However, Kean (1929) and Miller (1928) have described it as a rotation of the vascular elements.

There has been a number of American investigators of the problem; Siler Raphaelis Gehlen (1929) in describing *Cicer arietinum* L. and *Glottidium floridanum* DC. concluded that there was a shifting but no twisting of tissues; Siler (1931) and Thiel (1931) are among the first American investigators to conclude that there is no true root-stem transition but merely a developmental one which occurs gradually from the root to the midrib of the cotyledons. Jones (1912) says that the transition region in *Dianthera americana* L. is confined to the hypocotyl, while Gourley (1931) in *Pisum sativum* L. that it was completed only in the third internode. Avery (1930) concludes that the transition region in the Gramineae is entirely confined to stem structure and Hayward (1932) suggests that the appearance of internal phloem in *Ipomoea Batatas* Poir. at a time when photosynthetic activity begins may be correlated with the function of the phloem. Winter (1932) states that the primary vascular system of the root, hypocotyl, and cotyledons forms a complete conducting system of its own which is entirely independent of later plumular development.

Van Tieghem (1891) described three types of transition, Sargent (1903) a fourth in the monocot *Anemarrhena*, and Siler (1931) a fifth in *Helianthus annuus* L.

Gerard (1881), Sterchx (1900), and Chauveaud (1911) had quite different views as to the manner by which transition takes place. Each described *Nigella damascena* L. as a Ranunculaceous type interpreting its transition in the light of his views. Gerard and Chauveaud agreed that the vascular elements are continuous from the root to the cotyledons.

Lenfant (1897), Mansion (1897), and Nihoul (1892) in further detailed studies of Ranunculaceous seedlings have interpreted transition according to the views of Sterchx. Thomas (1914) studied seedling anatomy in a number of species in which she concluded that the Ranunculaceae are uniformly diarch and that transition occurs high in the hypocotyl.

Miller (1928) found asymmetrical development of cotyledonary traces in species of *Delphinium* and *Thalictrum* while Sargent (1903) concluded that the diarch stele in the typical Ranunculaceous seedlings is connected with the insertion of a vigorous plumular development on rather insignificant cotyledonary traces and are in direct connection with the primary root chiefly by secondary xylem.

Most investigators of seedling anatomy have not particularly stressed the relation between the primary axis and later plumular development. In some seedlings the vascular elements of the primary axis are continuous from root to cotyledons and transition is accomplished in the cotyledonary petiole or in the midrib of the cotyledons. In such situations as described by De-Fraigne (1912) and others, the plumular strands are absent and only occur with successive leaf development.

Primary Axis

The cotyledons of the youngest seedlings examined were still contained within the seed coat and the rudimentary first leaf inclosed in the cotyledonary tube. In a slightly older seedling the cotyledons functioned as foliage leaves. The epidermis consists of a single layer of cells much longer in their vertical than in their radial dimensions. The cortex has four or five layers of somewhat regularly shaped cells with characteristic triangular intercellular spaces. Both the endodermis and the pericycle are composed of a single layer of cells distinguishable from root to the upper part of the hypocotyl where both lose their identity. The radial walls of the endodermis show distinct thickenings. It is only in young seedlings in which the foliage leaves are still embryonic that the true development of the primary vascular system can be traced. With the expansion of foliage leaves and the growth of adventitious roots at the cotyledonary node its structure becomes obscured.

The path of development of the vascular system of the primary axis is determined in the embryo by the early differentiation of procambial strands which are continuous from the rudimentary root to the cotyledons.

The root stele is diarch. Xylem matures centripetally and slightly tangentially. In the youngest seedlings examined the central cells are parenchymatous. Approximately 0.41 mm. above the root tip the epidermis, cortex, and stele are clearly defined. The only differentiation of the stelar region at this level is seen in a linear group of larger polygonal cells which determine the position of the xylem root poles and are destined to become the primary xylem (Pl. 7, fig. 1). About 1 mm. above the root tip the first xylem elements differentiate. These elements consist of annular and spiral vessels. The phloem develops almost simultaneously with the xylem (Pl. 7, fig. 2).

The diarch root stele (Pl. 7, fig. 3) is continuous through the hypocotyl (Pl. 7, fig. 4) but in older seedlings a xylem plate is formed (Pl. 7, fig. 5). The first indication of transition occurs at the cotyledonary node where each phloem group separates into two parts. Each of the cotyledonary traces,



Fig. 1. Median longitudinal diagram of a young seedling showing the path of the stele from root to cotyledons.

which develop asymmetrically, consists of a xylem group and two phloem groups. Development of the vascular elements takes place rapidly at this level and the traces diverge at an angle of almost ninety degrees. (Fig. 1). Rearrangement from the radial exarch position of the xylem to the endarch collateral bundle in the cotyledonary petiole occurs as the traces enter the petiole. The traces continue as a single endarch collateral bundle in the cotyledonary petiole and enter the cotyledons as the midrib. Almost immediately the laterals are formed by two successive bifurcations. In general transition follows Van Tieghem's third type where the phloem elements divide. It likewise agrees with Compton's (1912) findings for transition in small seedlings.

The entire vascular system of the primary axis is continuous from root to cotyledons. There is no true root-stem transition since the endarch position of the xylem is arrived at neither in the hypocotyl nor in the stem. Thomas (1914) found a similar situation in certain Ranunculaceous seedlings but merely states that a rearrangement of the vascular elements occurs as the traces are given off. Smith (1931) interpreted a like condition in *Dionaea muscipula* Ellis ex L. as an inversion of the vascular elements as they leave the hypocotyl.

Plumular Development

Some time elapses between the development of the vascular system of the primary axis and that of the plumular region whose initial vascular elements are the traces of the foliage leaves. The plumular internodes are extremely short and ensheathed by the base of the leaf petioles. In a seedling with one expanded foliage leaf the median traces of the first two leaves lie opposite each other and at right angles to the cotyledonary traces. Each foliar trace consists of very few xylem elements and at a slightly higher level the second median trace consists entirely of procambial strands. At the first plumular node a procambial cylinder is formed with the few xylem elements centripetally arranged. These elements become the first median foliar trace and are

a continuation of the vascular elements of the primary axis. A slightly older seedling shows cambial activity.

The development of the plumular strands of a seedling with two foliage leaves is diagrammatically represented in (Pl. 8, figs. 6-11). The relation between the hypocotyl and the developing tuber and the relative amount of vascular tissue in each is shown in (Pl. 8, fig. 6). Slightly higher the vascular strands of the two axes have anastomosed and by rapid centripetal development of secondary xylem the position of the protoxylem is endarch. At this level a cylindrical stele is formed which is gradually dissected by the cotyledonary traces (Pl. 8, fig. 7). The cylindrical stele is so broken up by diverging cotyledonary traces and the first median foliar trace that the vascular situation at this level shows three collateral bundles (Pl. 8, fig. 8). At the first plumular node (Pl. 8, fig. 10) a ring of vascular tissue is again formed. With the completion of the first median trace the ring is again dissected by the divergence of the second median foliar trace (Pl. 8, fig. 11). The other traces are similarly given off but at successive nodes the vascular ring is not so complete and almost entirely procambial. At a slightly higher level five foliage leaves are distinctly outlined. In less than one-half millimeter the change from the root structure of the stele to the endarch position of the protoxylem and the definite formation of leaf outlines has taken place.

A seedling with five expanded leaves and three tubers shows clearly the relative importance of the vascular elements of the permanent axis to the plumular traces as compared with those of the primary axis. A small part of the plumular strands is derived from the primary axis (Pl. 9, fig. 12). Just a little above the level where the vascular elements of the primary axis, of the first tuber, and of the second tubers unite, the first median leaf trace is given off. The coalescence of the three xylem and phloem groups of the second tuber and their union with those of the primary axis and first tuber is shown in (Pl. 9, fig. 12). Slightly higher the cotyledonary traces derived from the primary axis are given off. With the complete divergence of the cotyledonary traces the vascular elements of the tubers develop tangentially in respect to each other to form a partial vascular ring (Pl. 9, fig. 13). Those supplied by the primary axis are represented by one small group "A" (Pl. 9, fig. 15). At the second plumular node the stele consists of a vascular ring whose elements are mostly secondary interspersed with xylem parenchyma (Pl. 9, fig. 16). Again the stele is dissected by the divergence of leaf traces and at this level (Pl. 9, fig. 17) shows four collateral bundles.

Three traces are supplied to each leaf except the first. All foliar traces are collateral and endarch with definite primary xylem. There is, however, secondary xylem as is evidenced by the presence of cambium.

Permanent Axis

The permanent axis or those seedling structures which carry the plant to maturity is a combination of plumular development and the growth of adventitious roots. These roots arise endogenously at the cotyledonary node. The first root develops simultaneously with the expansion of the first leaf. As the foliage leaves expand a second and third root develops.



Fig. 2. Semi-diagrammatic representation of a seedling showing the relation of primary axis to the permanent axis.

The swollen condition of the upper part of the adventitious roots as observed in a seedling with three expanded leaves clearly indicates tuber formation. Seedlings with four and five leaves show more pronounced tuber development. The continued growth of adventitious roots and their relation to the primary axis emphasizes the temporary condition of the primary axis. The cortex of the hypocotyl is gradually pushed aside and destroyed with the continued development of tubers and the plumular region. Fig. 2 is a semi-diagrammatic representation of the oldest seedling examined. The three tubers and the foliage leaves, which ensheath the plumular region, have become the most important part of the seedling. Comparisons with younger seedlings show conclusively that the primary axis is merely a structure from which the permanent axis is developed. Irmisch (1865) observed tuber formation in *Ranunculaceae* and made the same conclusions in regard to the transitory nature of the primary axis. Tuber development in the species examined in this study is identical with that which Irmisch found in *Ranunculus millefoliatus* Vahl.

There is variation in the number of xylem root poles in different tubers developed on the same seedling. A seedling with four expanded leaves and two well developed tubers shows a diarch stele in the first tuber. The vascular strands are at first separated by parenchyma cells but as growth continues centripetal differentiation of xylem produces a plate of cells. Cambial activity soon initiates secondary growth (Pl. 9, fig. 18). The same seedling shows the origin of the vascular elements of the second tuber whose stele is triarch. Slightly above the first plumular node traces are given off from the vascular cylinder as in leaf traces.

Since the plumular traces are endarch and in part derived from the vascular strands of tubers in which the position of the protoxylem is exarch, transition changes are initiated just below the cotyledonary node and completed with the anastomosing of the vascular strands of the main axis and the first tuber. The first noticeable change, a slight forking of the phloem, is almost immediately followed by a complete separation of the vascular

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elements into two parts. The protoxylem of one group soon becomes endarch through rapid centripetal development of secondary xylem. The other group joins the elements of the primary axis where the protoxylem gradually becomes endarch.

Discussion

Root-stem transition in seedlings is one of developmental growth rather than an actual transition of elements. The vascular strands differentiate along certain well defined paths determined in the embryo so that they are continuous morphologically either from root to plumule or from root to cotyledons. In *Echinops Ritro* L. Tronchet (1930) found both the cotyledonary and the intercotyledonary strands continuous from root to cotyledons. If the entire vascular system of the root is continued as the cotyledonary traces and in young seedlings there is no differentiation of plumular elements, it may be concluded that there is no true root-stem transition. This is the situation observed in *Ranunculus asiaticus* L. var. *superbissimus* (Hort.) and in a number of other seedlings where there is delayed plumular development. Thiel (1931) states that this situation observed in *Solanum Melongena* L. is the first citation where transition was observed outside the hypocotyl or the stem. However, in 1906 Hill (1906) described species of Piperales in which the endarch protoxylem of the cotyledons becomes exarch while still in the cotyledonary petiole. Thomas (1914) also found transition completed in the base of the cotyledonary petiole of certain Ranunculaceae; Siler (1931) and Tronchet (1930) observed that transition was completed in the midrib of the cotyledons in species of the Compositae. Thiel (1933) in further investigations with Solanaceous seedlings found transition completed in the midrib of the cotyledons as in *Solanum Melongena* L. while Avery (1933) in a study of seedlings of *Nicotiana Tabacum* L. concluded that transition is completed below the level of the cotyledonary node.

Blackburn (1917) suggests that the appearance of cambium may possibly be correlated with the amount of primary xylem and that cambium is early differentiated if there are few xylem elements in the primary axis. This study seems to indicate some relationship between cambium and xylem since young seedlings have few xylem elements until secondary growth occurs.

Plumular vascular elements may or may not exercise an influence upon transition. In those seedlings in which there is delayed development of the region it is evident that they play no part in the rearrangement of the vascular elements. DeFraigne (1912) concluded that if the plumular strands were developed, they had little, if any, effect upon transition; while Hill (1906) stated conclusively that in certain seedlings plumular strands have no influence upon it.

Tuber formation has been associated with the presence of cotyledonary tubes by Thomas (1914). Whether or not the correlation is a significant one, it is the condition in the species investigated. Their growth differs from that as described by Sargent (1903) for *Eranthis hiemalis* Salisb. and *Delphinium nudicaule* Torr. and Gray where the persistent hypocotyl grows into a spindle

shaped tuber either by pronounced cambial activity or by division of the cortical cells while in *R. asiaticus* L. var. *superbissimus* (Hort.) the hypocotyl plays no part in tuber formation. Artschwager (1918) states that most of the tuber tissue in *Solanum tuberosum* L. is derived from the perimedullary zone and to some extent from the parenchyma of external phloem, cortex, or pith. The tubers in the species investigated in this study are formed by the division of the cortical cells.

Conclusions

1. There is no true root-stem transition but a rearrangement from the exarch position of the root xylem to the endarch position of the collateral bundle at the base of the cotyledonary petiole.
2. The primary axis consisting of root, hypocotyl, and cotyledons is a transitory structure which gradually dies off.
3. The adult or permanent axis consists of tubers, plumular region, and foliage leaves.
4. Development of the first adventitious root at the cotyledonary node occurs simultaneously with that of the first foliage leaf.
5. The plumular internodes are very short with a vascular system consisting of leaf traces some of which are supplied by the primary, others by the permanent axis.
6. In each plumular trace there are primary vascular elements with additional secondary ones as indicated by the presence of cambium.
7. Transition is "high" as is normal for small seedlings and approximates Van Tieghem's third type.

This study was undertaken at the suggestion of Dr. J. H. Hoskins, Botany Department, University of Cincinnati, and visiting Professor at Notre Dame, to whom I wish to express my appreciation for his helpful suggestions.

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BIBLIOGRAPHY

- ARTSCHWAGER, E. F. 1918—Anatomy of the potato plant with special reference to the ontogeny of the vascular system. *Journ. Agr. Res.*, vol. 14, pp. 221-252.
- AVERY, GEO. S., JR. 1930—Comparative anatomy and morphology of embryos and seedlings of maize, oats and wheat. *Bot. Gaz.*, vol. 89, pp. 1-39.
- 1933—Structure and germination of tobacco seed and the developmental anatomy of the seedling plant. *Amer. Journ. Bot.*, vol. 20, pp. 309-327.
- BLACKBURN, KATHLEEN B. 1917—On the vascular anatomy of the young epicotyl in some Ranalian forms. *Ann. Bot.*, vol. 31, pp. 151-180.
- BODMER, HELEN. 1928—Beiträge zur Anatomie und Physiologie von *Lythrum Salicaria* L. *Beih. Bot. Centralbl.*, vol. 45, pp. 1-58.
- CHAUVEAUD, G. 1911—L'appareil conducteur des plantes vasculaires et les phase de son évolution. *Ann. des Sci. Nat.*, sér. 9, vol. 13, pp. 112-426.
- COMPTON, R. H. 1912—An investigation of the seedling structure in the Leguminosae. *Journ. Linn. Soc. Bot.*, vol. 41, pp. 1-122.
- DE FRAINE, ETHEL. 1912—The anatomy of the genus *Salicornia*. *Journ. Linn. Soc. Bot.*, vol. 41, pp. 317-346.
- GEHLEN, SISTER RAPHAELIS. 1929—Stelar anatomy of *Cicer arietinum* and *Glottidium floridanum*. *Amer. Journ. Bot.*, vol. 16, pp. 781-788.
- GERARD, R. 1881—Recherches sur le passage de la racine à la tige. *Ann. Sci. Nat. Bot.*, sér. 9, vol. 11, pp. 279-430.

- GOURLEY, JOSEPH H. 1931—Anatomy of the transition region of *Pisum sativum* L. Bot. Gaz., vol. 92, pp. 367-383.
- GRAVIS, A. 1919—Connexions anatomiques de la tige et de la racine. Bull. Acad. Roy. Belg. Cl. Sci., sér. 5, vol. 5, pp. 227-256.
- HAYWARD, HERMAN E. 1932—Seedling anatomy of *Ipomoea Batatas*. Bot. Gaz., vol. 93, pp. 400-420.
- HILL, T. G. 1906—On seedling structure of certain Piperales. Ann. Bot., vol. 20, pp. 159-175.
- AND E. DE FRAINE. 1913—A consideration of facts relating to structure of seedlings. Ann. Bot., vol. 27, pp. 257-272.
- IRMISCH, THILO. 1865—Ueber einige Ranunculaceen. Bot. Zeit., vol. 23, pp. 29-32.
- JONES, W. RALPH. 1912—Development of the vascular structure of *Dianthera americana*. Bot. Gaz., vol. 54, pp. 1-30.
- KEAN, CHRISSY I. 1929—Seedling anatomy in the genus *Mesembryanthemum*. Trans. and Proc. Bot. Soc. Edinburgh, vol. 30, pp. 164-174.
- LENFANT, C. 1897—Contribution à l'anatomie des Renonculacées. Le genre *Delphinium*. Arch. Inst. Bot. Univ. Liege, vol. 1.
- LENOIR, MAURICE. 1919—Évolution du tissu vasculaire chez quelques plantes de Dicotyledones. Ann. des Sci. Nat. Bot., sér. 10, vol. 2, pp. 1-123.
- MANSION, A. 1897—Contribution à l'anatomie des Renonculacées. Le *Thalictrum flavum*. Arch. Inst. Bot. Univ. Liege, vol. 1.
- MILLER, ELIZABETH. 1928—On the occurrence of schizocotyl in certain Ranunculaceae seedlings. Trans. and Proc. Bot. Soc. Edinburgh, vol. 30, pp. 21-36.
- NIHOUL, E. 1892—Contributions à l'étude anatomique des Renonculacées. *Ranunculus arvensis* L. Mém. l'Acad. Roy. de Belgique Brux., vol. 52.
- SARGANT, ETHEL N. 1900—A new type of transition from stem to root in the vascular system of seedlings. Ann. Bot., vol. 14, pp. 633-638.
- 1903—A theory of the origin of the Monocotyledons founded on seedling structure. Ann. Bot., vol. 17, pp. 1-92.
- SCOTT, F. MURRAY AND HELEN N. SHARSMITH. 1933—The transition region in the seedling of *Ricinus communis*: a physiological study. Amer. Journ. Bot., vol. 20, pp. 176-187.
- SILER, MARGARET BENEDICT. 1931—Transition from root to stem in *Helianthus annuus* L. and *Arctium minus* Bernh. Amer. Midl. Nat., vol. 12, pp. 425-487.
- SMITH, CORNELIA M. 1931—Development of *Dionaea muscipula*. Bot. Gaz., vol. 91, pp. 377-394.
- STERCHX, R. 1897—Contribution à l'anatomie des Renonculacées. Arch. Inst. Univ. Liege, vol. 1.
- 1900—Recherches anatomiques sur l'embryo et les plantules dans la famille des Renonculacées. Arch. Inst. Bot. Univ. Liege, vol. 2.
- THIEL, A. F. 1931—Anatomy of the primary axis of *Solanum Melongena*. Bot. Gaz., vol. 92, pp. 407-419.
- 1933—Vascular Anatomy of certain Solanaceous plants. Bot. Gaz., vol. 94, pp. 598-604.
- THOMAS, E. N. 1907—A theory of the double leaf-trace founded on seedling structure. New Phytol., vol. 6, pp. 77-91.
- 1914—Seedling anatomy of Ranales, Rhoeadales, and Rosales. Ann. Bot., vol. 28, pp. 695-733.
- TRONCHET, A. 1927—La morphogénèse de l'appareil conducteur chez les phanérogames. Bull. Soc. Roy. Bot. Belg., vol. 59, pp. 142-159.
- 1930—Recherches sur les types d'organisation les plus répandus de la plante des Dicotyledons, leurs principales modifications, leurs rapports. Arch. de Bot., mém. 4, pp. 1-252.
- VAN TIEGHEM, PHILIPPE. 1891—Traité de botanique.
- WINTER, CLARA WOLFANGER. 1932—Vascular system of young plants in *Medicago sativa*. Bot. Gaz., vol. 94, pp. 152-167.
- MARYMOUNT COLLEGE,
SALINA, KANSAS.

EXPLANATION OF SYMBOLS

In the diagrams phloem is black and xylem cross hatched. The following symbols are used throughout the drawings:

End., Endodermis; Per., Pericycle; p., plerome; px., protoxylem; mx., metaxylem; x2, secondary xylem; cb, cambium; p a, primary axis; t1, first tuber; t2, second tuber; t3, third tuber; cot t., cotyledonary trace; m l t, median leaf trace; l l t, lateral leaf trace.

PLATE VII

- Fig. 1. Stele 0.41 mm. above root tip showing differentiation of endodermis, pericycle, and plerome. x 360.
 Fig. 2. Stele about 1 mm. above root tip x 360.
 Fig. 2. Stele about 1 mm. above root tip x 360.
 Fig. 3. Upper root stele. x 800.
 Fig. 4. Stele of hypocotyl slightly below the level of the cotyledonary node. x 800.
 Fig. 5. A comparative level of the hypocotyl as in fig. 4 but in an older seedling. x 360.

PLATE VIII

- Figs. 6-11. Seedling with two expanded leaves.
 Fig. 6. At a level slightly below the cotyledonary node showing steles of the primary axis and the first tuber. x 55.
 Fig. 7. 0.17 mm. above fig. 6 showing the anastomosing of the steles of the primary axis and the first tuber with slight indication of the cotyledonary traces. x 55.
 Fig. 8. 0.03 mm. above fig. 7 showing three collateral bundles and first median foliar trace. x 55.
 Fig. 9. Detail of bundle "A" fig. 8. x 240.
 Fig. 10. First plumular node. .03 mm. above fig. 9. x 55.
 Fig. 11. At a level of .04 mm. above fig. 10 showing the origin of second median leaf trace. x 55.

PLATE IX

- Figs. 12-18. Seedling with five expanded leaves.
 Fig. 12. Slightly below the level of the cotyledonary node showing the anastomosing of the steles of the primary axis, first tuber, and second tuber. x 55.
 Fig. 13. Cotyledonary traces and the complete fusion of the three root poles of second tuber. .05 mm. above fig. 12.
 Fig. 14. Detail of bundle "A" fig. 13. x 240.
 Fig. 15. Anastomosing of steles of first and second tuber .05 mm. above fig. 13 x 55.
 Fig. 16. Second plumular node .07 mm. above fig. 15. x 55.
 Fig. 17. Second plumular internode .05 mm. above fig. 16. x 55.
 Fig. 17a. Detail of bundle "A" fig. 17. x 240.
 Fig. 18. Section of stele of first tuber. x 240.

PLATE X.

- Figs. 19-22. Seedling with four expanded foliage leaves showing origin of leaf traces. x 43.
 Fig. 19. Origin of leaf traces and cotyledonary traces.
 Fig. 20. No cotyledonary traces shown. .04 mm. above fig. 19.
 Fig. 21. No cotyledonary traces shown .06 mm. above fig. 20.
 Fig. 22. Five foliage leaves with leaf traces. .2 mm. above fig. 21.

PLATE XI

- Fig. 23. Diagram of root-stem transition.



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PLATE VII

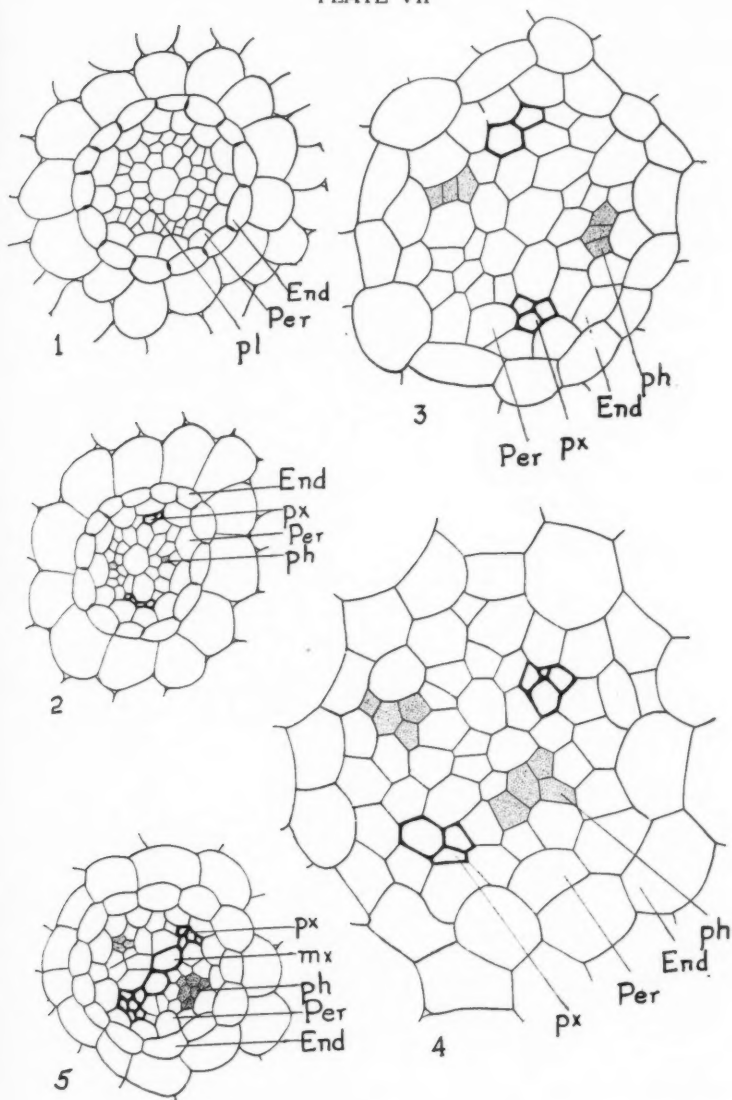


PLATE VIII

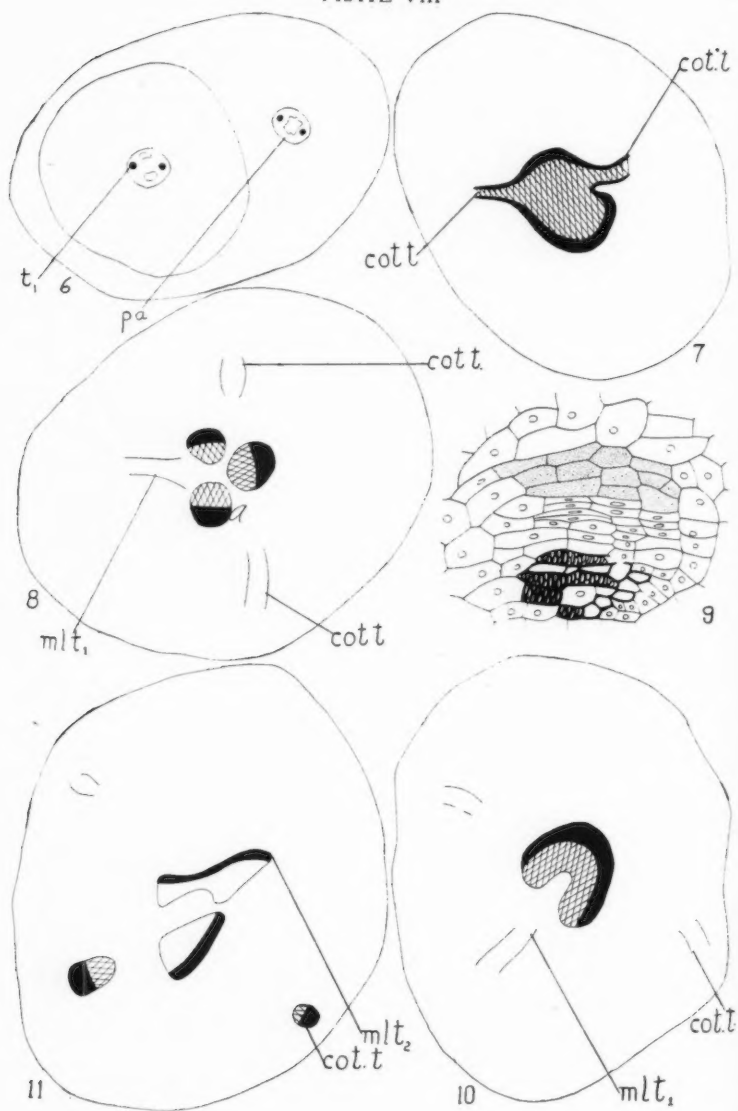


PLATE IX

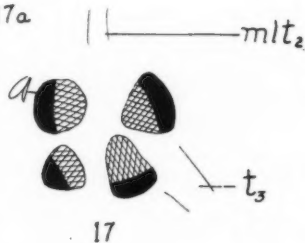
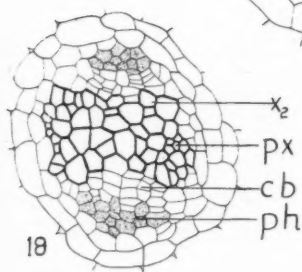
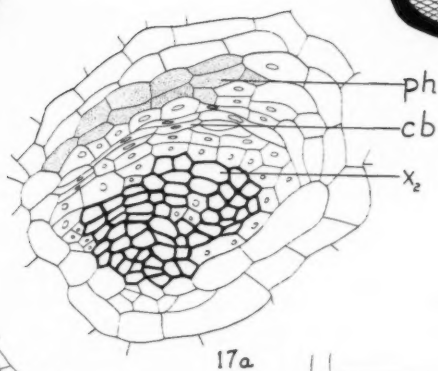
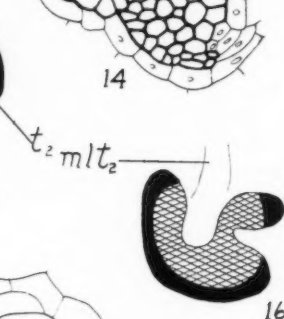
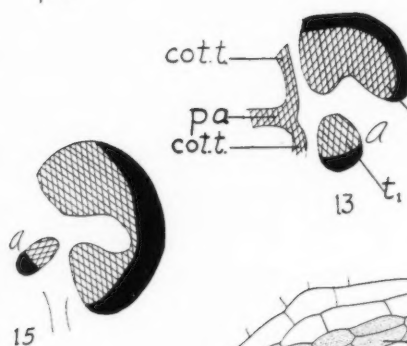
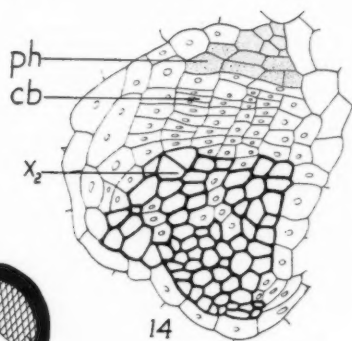
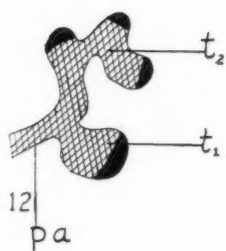


PLATE X.

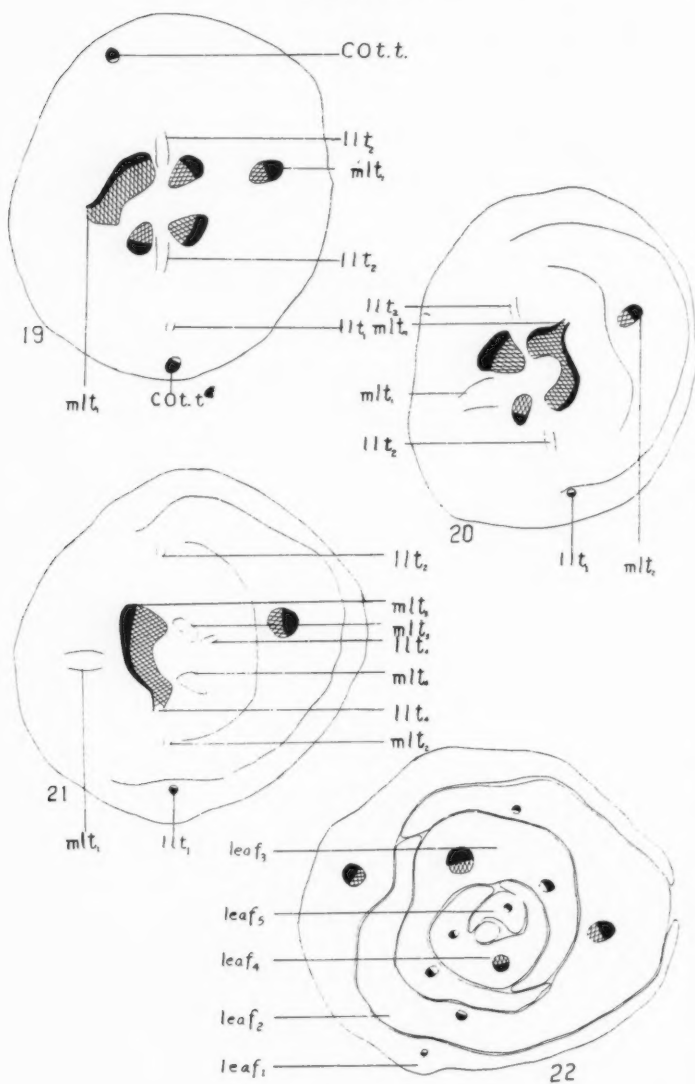
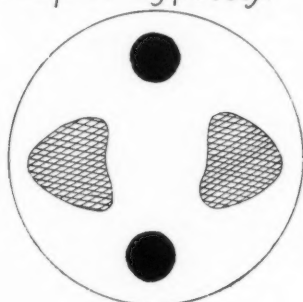


PLATE XI



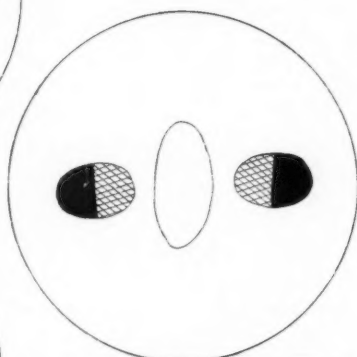
c Top of Hypocotyl



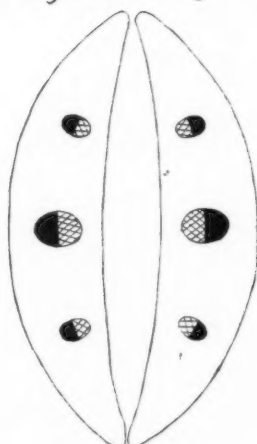
b Hypocotyl



23 a Root



d. Cotyledonary Tube



e Cotyledons

PSARONIUS ILLINOENSIS

J. H. HOSKINS

Lesquereux, as early as 1858, reported the occurrence of silicified stems from the Pennsylvanian of Virginia, Ohio and Pennsylvania, some of which based on later collections and reports were without doubt the petrified stems known as *Psaronius*. Specimens of this genus since have been reported from the Upper Carboniferous of Illinois, Iowa, Kentucky, Ohio, West Virginia. The majority of these specimens have not been identified as to species. The writer at present is engaged in making specific determinations of specimens from several of these localities.

In 1871 Dawson described *Psaronius erianus* and *P. textilis* based on casts of stems occurring in the Hamilton formation of the Devonian, near Gilboa, N. Y. These specimens have been shown by Miss Goldring (1927) to be not *Psaronius* but species of a Pteridisperm to which Miss Goldring gave the generic name *Eospermatopteris*. Dawson's species, therefore, becomes *Eospermatopteris erianus* (Dawson) Goldring, and *E. textilis* (Dawson) Goldring.

Lesquereux in 1880 described a silicified stem from the Pennsylvanian of Peoria Co., Illinois, which bore the leaf-scars upon its surface in the arrangement characteristic of the genus *Caulopteris*. Lesquereux called this fossil *C. Giffordi*. The internal structure, even though indistinctly seen, was sufficient to identify the stem as one belonging to the genus *Psaronius*, and in 1899 Potonié referred the specimen to that genus. The internal structure of *P. Giffordi* was, however, unfortunately never described in any further detail.

In 1893 Herzer reported a petrified stem from Monroe County, Ohio as a new genus, *Winchellina fascina*. In his figure the peripheral root-zone and central stem organization characteristic of *Psaronius* were clearly shown. Immediately attention was called to the error in identification and in 1897 in reporting other similar specimens from Athens County, Ohio, Herzer accepted the correction. Herzer (1901) described from superficial characters only, *Psaronius junceus* and *Caulopteris magnifica*. In the case of *P. junceus* the specific identification was based on the incidental features of the weathered exterior of the root-zone, no leaf scars being present. In both of the specimens the internal structure of *Psaronius* was apparent although it was never elucidated. Knowlton (1902) immediately emphatically stated that these descriptions were altogether inadequate.

Again in 1902 Herzer reported other specimens from Athens, Ohio and Wheeling, West Virginia as the new species, *P. vermiculus*. This species, as in the former instances, was based on incidental external features of the petrification and cannot be considered as a valid species. In the same report he lists a flattened silicified specimen bearing leaf-scars on its surface as a new species of *Stemmatopteris*. His illustration discloses the fact that this specimen also had the internal structure of *Psaronius*, but as before, it was not described.

In 1907 Macbride described certain portions of a stem from Hardin County, Iowa, as *P. borealis*. Several years later Farr (1914) described the structure of a much better specimen from the same locality and presumably from the same horizon. Farr's specimen consisted of a cylindrical axis some fourteen inches long and three inches in diameter. In addition to the preserved vascular tissues of the stem, this specimen also clearly showed the arrangement of leaf-scars which were not hidden by the usual development of adventitious roots. Farr did not ascribe his plant to a particular species, but by appending Macbride's entire description of *P. borealis* to his account, he seemed to indicate that the two specimens were to be considered as identical species. He made no statement to that effect, however.

No specimens of *Psaronius* heretofore have been described from the calciferous coal-balls found in the American Upper Carboniferous. Free rootlets are not uncommon (Hoskins, 1927, 28, 30) and in fact in some petrifications are the most common fossil, not excepting the so-called 'Stigmarian rootlets.' Parts of the inner compact root-zone also not uncommonly found. The present account of a *Psaronius* stem is based on sections of a calciferous petrification* from the McLeansboro formation of Illinois. The specimen is not complete, and consists of a portion of the stem and peripheral zone of adventitious roots, flattened in form to approximately eight centimeters long, five centimeters wide and from one to two centimeters in thickness. A description of the species follows:

Psaronius illinoensis sp. nov.

ROOT ZONE

The zone of adventitious roots is narrow, with no indication that it had ever developed to a greater thickness at this level. It is but two or three roots in width as is shown in fig. 1. The individual roots are small, few reaching a diameter larger than one millimeter. The usual number of xylem arms in the stele of the roots is six, although some of the smaller have either four or five. The majority of the roots shown in fig. 1 show the protoxylem cells and one or two metaxylem cells in isolated groups. In a few instances the outline of connective cells between the protoxylem poles is seen. This suggests the possibility that these roots are but newly formed with lignification of the metaxylem yet incomplete, although the arms of the xylem of the roots of *Psaronius* are frequently unconnected. In this instance, however, there is an unusual restriction in the amount of lignification. Phloem usually is not preserved, but is present in a few instances.

Outside the stele, the cortex of the root is separated into two zones. The inner zone is composed of thin-walled parenchyma, the cells rather uniform in size and without the development of lacunar tissue which is characteristic of the outer free roots of *Psaronius* generally. There are, however, occasional larger cells with dark content which have the appearance of gum canals. These

* The writer is deeply indebted to Professor A. C. Noé of the University of Chicago for the petrifications on which this paper is based.

are present sparingly in almost all of the roots. The outer zone of the root cortex is a band of sclerenchymatous cells, some six to eight cells in width, on the average, although there is a very great variation in the width.

The proportion of interstitial tissue to the area occupied by the roots themselves is large. Fig. 1 shows the fairly separated position of the roots. The interstitial tissue which simulates cortical parenchyma may be observed in this section to be in cellular continuation with the peripheral cells of the root cortex. Some of the sections show excellent views of the origin of the tissue which surrounds the roots and in which they seem to be imbedded but which actually arises from the peripheral cells of the roots themselves.

ANATOMY OF THE STEM

The outer root-zone is separated from the stem proper by what is apparently an almost continuous band of sclerenchyma. The numerous bundles which composed the part of the stele of the stem present in this specimen are the usual elongated, curved or hooked strands. Here (fig. 1) they are closely compressed, and their normal arrangement cannot be determined. Each strand is separated from the next adjacent bundle by a group of compressed parenchyma cells. There is no evidence that the strands of sclerenchyma entered into the stem. The bundle is composed of tracheids with scalariform markings and xylem parenchyma. The width of the bundle and the size of the cells are approximately the same as that of the leaf trace which will be described presently. It was not possible to identify with certainty any protoxylem groups.

The most obvious structure in fig. 1 is the crescent-shaped leaf trace. It is bounded on the outer side by a heavy band of sclerenchyma, and it is cut off from the stele proper by a narrow, less conspicuous sclerenchyma strand. The extreme width of the trace is approximately one half centimeter. The xylem of the trace is composed of tracheids which are rather uniform in size, and xylem parenchyma. The tracheids are slightly elongated in a radial direction as seen in transverse section and average approximately .01mm in diameter. Surrounding the xylem is a narrow band of phloem, parts of which are well preserved. On the inner edge of the trace are groups of cells which appear to be protoxylem, but it has been impossible to demonstrate this fact in longitudinal section. Fig. 2 is an enlarged view of the trace seen in fig. 1.

On the inside of the trace and to a lesser extent on the outer side are large openings in the parenchyma ground tissue frequently filled with a dark substance. These are apparently gum canals of the same type, but larger, as those found in the cortical parenchyma of the adventitious roots.

The anatomy of the genus *Psaronius* has been well worked out by European investigators, and the species are classified basically on the phyllotaxis. In the specimen described here it has not been possible to use this basis of classification because only a part of the stem is preserved. It may also be mentioned that the crescent-shaped leaf trace seen in figs. 1 and 2 may not be the outermost trace of the stem at this level, because almost without exception in other species, the trace divides to form two separate strands as it enters

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the base of the petiole, even though later it gives rise to the single entire trace within the petiole. The vascular strands which belong to the next higher leaves are, however, usually entire, and frequently crescent-shaped as in the illustrations. As there are exceptions to the splitting of the trace as it enters the base of the petiole, it is impossible to state without additional information, the exact role of the trace in fig. 1.

BIBLIOGRAPHY

- DAWSON, J. W. 1871—Geol. Survey of Canada. London. pp. 58-59.
- FARR, CLIFFORD H. 1914—Note on a fossil-fern of Iowa. Proc. Iowa Acad. Sci. 21, p. 59.
- GOLDRING, WINIFRED, 1927—The oldest known petrified forest. Scientific Monthly 24, p. 514.
- HERZER, H. 1893—A new tree from the Carboniferous rocks of Monroe County, Ohio. American Geologist, vol. 11, p. 285.
- 1897—*Psaronius*. 5th Annual Report of the Ohio State Academy of Science, p. 55.
- 1901—Six new species, including two new genera, of fossil plants. 9th Annual Report of the Ohio State Academy of Science, p. 22. (1900).
- 1902—New fossil plants from the Carboniferous and Devonian. 10th Annual Report of the Ohio State Academy of Science, p. 40. (1901).
- HOSKINS, J. H. 1928—Structure of some Carboniferous plants from Illinois. Proc. Indiana Acad. Sci., vol. 37, p. 373. (1927).
- 1928—Notes on the structure of Pennsylvanian plants from Illinois. II. Bot. Gaz., vol. 85, p. 74.
- 1930—Contributions to the Coal Measure flora of Illinois. Amer. Midland Naturalist, vol. 12, p. 154.
- KNOWLTON, F. H. 1902—Six new species. Science, no. 398, p. 273.
- LESQUEREUX, L. 1858—(In H. D. ROGERS, Geol. of Pennsylvania, p. 869.)
- 1880—Second Geol. Survey of Pa., Report of Progress. p. 343.
- MACBRIDE, T. H. 1907—On certain plant remains in the Iowa State University herbarium. Proc. Davenport Acad. Sci., vol. 10, p. 153.
- POTONIE, H. 1899—Lehrbuch der Pflanzenpalaeontologie, p. 70.

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Fig. 1. Transverse section of portion of axis of *Psaronius illinoensis* showing compressed bundles of the stem below, a single large entire leaf-trace surrounded by a band of sclerenchyma, and above, a narrow zone of adventitious roots. $\times 5$.



Fig. 2. Enlarged view of the vascular bundle of the leaf-trace shown in fig. 1. $\times 24$.

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* Contribut

THE RHIZOPODA OF THE NOTRE DAME REGION*

FRANCIS WENNINGER, C.S.C.

The species described in this paper were all found in St. Mary's and St. Joseph's Lakes, on the campus of the University of Notre Dame. St. Mary's Lake has a water area of about thirty acres, while the waters of St. Joseph's Lake cover sixty-five acres. The lakes are separated by a stretch of low ground containing about ten acres. This ground was formerly submerged so that both lakes constituted a single body of water.

In and about these lakes there is an extensive deposit of marl, the average thickness of which is estimated to be about thirty feet. An analysis of this marl, made by Noyes and published in the Twenty-fifth Annual Report of the Indiana State Geologist, shows the following percentage composition.

Calcium carbonate	91.62	Calcium phosphate	0.14
Magnesium carbonate	4.02	Insoluble portion	0.19
Alumina	0.05	Organic matter	2.25
Ferric oxide	0.07		

It has been suggested that the presence of this deposit might have a determining influence both on the quantity and the character of the protozoan life in these lakes. To test the validity of this suggestion, examinations were made of the waters of the pools, puddles and small bogs, as well as of the St. Joseph River. But everywhere the same species of Rhizopoda were found. It seems, therefore, that the alkalinity of the water of these two lakes has no influence upon the numbers or the kinds of species found.

Rhizopoda are found everywhere where there is moisture and not too much shade. Their favorite habitat seems to be the superficial ooze of lakes and ponds. Here they live in association with diatoms, desmids and other minute algae, which constitute their principal food. They seem never to penetrate into the deep mud. They are also to be found in damp, shady places among algae, liverworts and mosses, about the roots of sedges, rushes and grasses, or about the roots of shrubs and trees growing on the borders of bogs and ponds, or along ditches. Heliozoa seem to prefer floating plants as habitations. They are frequently found attached to Lemna, Ceratophyllum, Utricularia and the various algae, such as, Zygnema, Spirogyra and Oscillatoria.

Rhizopoda may be collected during the temperate seasons of the year, and even in winter in localities that are not too much exposed to severe cold. But specimens collected in winter are very few, and are always inactive. Frost seems to destroy them.

I have found no specimens among actively decaying vegetal matter, nor in foul water. This fact should be taken into account when an aquarium is to be started in the laboratory. The most serviceable aquarium is a dish which has a depth of about three inches. The material may be placed into

* Contributions to the Fauna and Flora of Indiana, No. 4.
(363)

this dish after a thin stratum of ooze—not more than an eighth of an inch in depth—has been allowed to settle on the bottom. Rhizopoda thrive in light, but direct sunlight must be avoided.

Genus DINAMOEBA

Amoeba-like, oval or elongated when alive. Pseudopodia few or many, mostly simple extensions of the ectosarc. Posterior region often has short blunt papillae. Spicules present.

Dinamoeba mirabilis Leidy.

Dinamoeba mirabilis Leidy: Proc. Ac. Nat. Sci. 1874, 142, 155.

Amoeba tentaculata Leidy: Proc. Ac. Nat. Sci. 1874, 167.

Dinamoeba Leidy: Proc. Ac. Nat. Sci. 1877, 288.

Body resembles that of *Amoeba proteus* but has a more regular outline. The pseudopodia usually extend from all parts of the periphery, are very long and have minute lateral processes. The body is often surrounded by a broad layer of hyaline protoplasm which bears minute spicules in such numbers that the protoplasm receives a striated appearance. There are often two nuclei, but they, as well as the contractile vacuole are usually obscured by the constituents of the cell. Spheroidal forms measure from 64 to 160 μ . Creeping forms are 150 μ long by 60 μ broad. The species is found in the lakes as well as in the water of ponds. Individuals are frequently found with their endoplasm densely packed with diatoms and desmids.

Genus AMOEBA

The ectoplasm and endoplasm are usually sharply differentiated. The pseudopodia are lobe-like and only occasionally branched. There is one large nucleus and many small nuclei. There are one or more contractile vacuoles.

Amoeba proteus Leidy.

Der Kleine Proteus Rösel: Insekt. Belustig. 1755, III., 621, tab. CI.

Volvox proteus Pallas: Elenchus Zoophytorum, 1766, 417.

Chaos Protheus Linnæus: Syst. Nat. 1767, i, 1326.

Proteus diffuens Müller: Animal. Infus. 1786, 9, tab. ii, figs. 1-12.

Vibrio proteus Gmelin: Linn. Syst. Nat. 1788, 3899.

Amiba divergens Bory: Dict. Clas. Hist. Nat. 1822, 261.

Amoeba princeps Ehrenberg: Abh. Ak. Wis. Berlin, 1831, 28, 79; Infusionsthierchen, 1838, 126, Taf. viii, fig. x.—Perty: Kennt. kleinst. Lebensf. 1852, 188. Auerbach: Zeitschr. wiss. Zool. 1856, 407, taf. xii, figs. 1-10.—Dujardin: Hist. Nat. Zoophyt. Infus. 1841, 232, pl. i, fig. 11.

Amoeba ramosa Fromentel: Etud. Microzoaires, 346, pl. xxviii, fig. 2.

Amoeba communis Duncan: Pop. Sci. Rev. 1877, 233.

Amoeba proteus Leidy: Pr. Ac. Nat. Sci. 1878, 99.

This amoeba was the first to be described. It is too well known to want further description. It is common in the superficial ooze of ponds, ditches, lakes and rivers, though it rarely occurs in large numbers. There are many blunt, thick pseudopodia extruded, and these form the bulk of the body. There is usually a single nucleus which has a characteristic lens shape, and one or more vacuoles. The food of the species consists of bacteria, algae, arcellae and infusoria. It may at times capture and devour several *Paramecia*. It grows best in stagnant water which contains many bacteria. The globular

form reaches
by 380 μ .

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form reaches a size of 200μ . The largest specimen measured 600μ by 200μ by 380μ .

Amoeba radiosa Ehrenberg.

Amoeba radiosa Ehrenberg: Abh. Ak. Wis. Berlin, 1830, 39; Infusionsth. 1838, 128, taf. viii, fig. 13.—Dujardin: Infus. 1841, 236, pl. iv figs. 2, 3.—Carter: An. Mag. Nat. Hist. 1856, 243, pl. v. figs. 10-18.

Amoeba brachiata Dujardin: Infus. 1841, 238, pl. iv, fig. 4.—Fromentel: Etud. Microzoires, 347, pl. xxix, fig. 4.

Amoeba ramosa Dujardin: Infus. 1841, 239, pl. iv, fig. 5.

This is a comparatively small form. It is colorless and transparent, though coloring matter is readily taken in. It is habitually stellate with a spheroidal or oval central mass, and has from two to a dozen pseudopodia disposed in a radiating manner. The pseudopodia are mostly conical and acute or attenuated thread-like and fairly rigid. They may be simple and straight or curved. There is usually one conspicuous contractile vacuole, or there may be several smaller ones. The nucleus is distinct. The species occurs almost everywhere, and at all times in association with other Rhizopoda. Its favorite habitat is the ooze of ponds or among aquatic plants. The diameter of the forms varies between 12 and 45 though forms have been found whose diameter was 60μ . The pseudopodia average 80μ in length.

Amoeba limax Dujardin.

The systematic position of this form seems to be very doubtful. Leidy places it among the synonyms for *Amoeba proteus*. Pritchard suggests that the form described under this name is merely a young principleps or proteus. The animal is slug-like and usually moves with the broad end forward. The nucleus is changeable in form. There is generally but one contractile vacuole. The endoplasm is often filled with brilliant granules. The habitat is the ooze of ponds. Even the largest individuals never reach a size of 100μ .

Amoeba verrucosa Ehrenberg.

Amoeba verrucosa Ehrenberg: Infusionsthierehen, 1838, 126, taf. viii, fig. 11.—Dujardin: Infus. 1841, 236.—Perty: Kennt. kleinst. Lebensf. 1852, 188.—Carter: An. Mag. Nat. Hist. 1857, xx, 37, pl. i, figs. 12, 13.—Leidy: Pr. Ac. Nat. Sci. 1876, 198; 1878, 158.

Amoeba natans Perty: Kennt. kleinst. Lebensf. 1852, 188, taf. viii, fig. 14.

Amoeba quadrilineata Carter: An. Mag. Nat. Hist. 1856, xviii, 243, pl. v, fig. 3; 248, pl. vii, fig. 81.—Barker: Quart. Jour. Mic. Sc. ix, 1869, 94.—Leidy: Pr. Ac. Nat. Sci. 1874, 167.

Thecamoeba quadripartita Fromentel: Etud. Microzoires, 346, pl. xxviii, fig. 3.

A mature animal is very sluggish in its movements. It rolls along slowly or it may be entirely motionless. Its shape may be oval, round or quadrately rounded, with a wrinkled surface. The pseudopodia are short, blunt projections of the ectosarc. The animal is highly transparent and colorless and shows a high differentiation of ectosarc from endosarc. The ectosarc appears homogeneous, but under high powers of the microscope, it is seen to be granular. The nucleus usually appears in the endosarc. There is always at least one nucleus, and two or three nuclei are not uncommon. The animal is commonly found in moisture, in association with algae. Its size varies between 80 and 100μ .

Amoeba villosa Wallich.

Amoeba villosa Wallich An. Mag. Nat. Hist. 1863, 366, pl. ix, 434, pl. x, figs. 5-9.

Duncan: Pop. Sc. Rev. 1877, 217, pl. vi, figs. 38-40.

Amoeba princeps Carter: An. Mag. Nat. Hist. 1863, xii, 30, 44, pl. iii, figs. 1-3.

Trichamoeba hirta Fromentel: Etud. Microzoaires, no date, 345, pl. xxviii, fig. 4.

This form regularly assumes a clavate or palmate shape. It protrudes a few short, thick, digitate or conical pseudopodia. The posterior extremity terminates in a villous area of variable form, but mostly this area becomes rounded, knob-like or discoid. There is a single large nucleus centrally in the body, and, posterior to this, a single conspicuous vacuole.

Genus ARCELLA

The animals secrete a shell of chitinous material, semispheroidal in shape when viewed laterally, but circular when viewed dorsally or ventrally. The mouth is central. The pseudopodia are digitate or broadly lobate, and never branched. The nuclei and contractile vacuoles are always numerous. The substance of the body does not completely fill the shell.

Arcella vulgaris Ehrenberg.

Arcella vulgaris Ehrenberg: Abh. Ak. Wiss. Berlin, 1830, 40, 53, 61, 69, 70, 75,

taf. i, fig. 6; 1831, 90; 1871, 234. Infus. 1838, 133, taf. 9, fig. 5.—Dujardin:

Infus. 1841, 247, pl. ii figs. 3-5.—Perty: Kennt. klein. Lebsf. 1852, 183, 186,

taf. ix, figs. 1-3.—Carter: An. Mag. Nat. Hist. xviii, 1856, 128, 221, pl. vii,

fig. 79; xiii, 1864, 30, pl. ii, fig. xiv.—Clapere de and Lachmann: Etud. Infus.

Rhizop. 1858, 9, i, 444.—Pritchard: Hist. Infus. 1861, 555, pl. xxi, figs. 7-9.

—Wallich: An. Mag. Nat. Hist. xiii, 1864, pl. xvi, figs. 34-37.—Hertwig and

Lesser: Arch. mik. Anat. 1874, 96.—Leidy: Proc. Ac. Nat. 1874, 14; 1874,

14; 1876, 55.—Bütschli: Arch. mik. Anat. 1875, 459, taf. xxv.

Arcella dentata Ehrenberg: Ab. Ak. Wis. Berlin, 1830, 40; 1831, 90. Infus. 1838,

134, taf. ix, fig. 7. Perty: Kennt. klein. Lebsf. 1852, 186.

Arcella hemispherica Perty: Kennt. klein. Lebsf. 1852, 186, pl. ix, fig. 5.

Arcellina vulgaris Carter: An. Mag. Nat. Hist. xviii, 1856, 247.

A. Sticholepis vulgaris Ehrenberg: Abh. Ak. Wis. Berlin, 1871, 244.

A. Homoeochlamys angulosa Ehrenberg: *ibid.*

This species shows much variation both in size and in form. The lorica is round or bell-shaped, with a hemispherical and turgid back. It is smooth but with rows of minute granules that are yellowish or black. Hexagonal prisms are discernible in the shell. The protoplasm is united to the inside of the shell by delicate threads. The pseudopodia are long, straight and transparent. There are two nuclei, opposite in position. The contractile vacuoles are numerous. The diameter of the shell is 75 μ .

Arcella discoides Ehrenberg.

Arcella discoides Ehrenberg: Monatsbr. Ak. Wis. Berlin, 1843, 139; Abh. Ak. Wis.

Berlin, 1871, 259, taf. iii, fig. 1.—Leidy: Proc. Ac. Nat. Sc. 1876, 56.

A. Homoeochlamys discoides Ehrenberg: Ab. Ak. Wis. 1871, 244.

Arcella peristica Ehrenberg: Microgeologie, 1854, 331; Ab. Ak. Wis. 1871, 260, taf. iii, figs. 11, 12.

A. Heterocosmia peristica Ehrenberg: Ab. Ak. Wis. 1871, 245.

This form is frequently confused with *Arcella vulgaris*. Indeed, there are authors who believe that the two forms are identical. The pseudopodia are few and digitate, and seldom expanded. There are usually two nuclei, though

specimens have been found that had one or three. The shell is circular or shield-shaped and regularly punctate. The dome is low and evenly convexed to rounded, or slightly expanded with a basal border that is rounded. This form is found everywhere in association with vulgaris. The diameter of the shell is 125μ .

Arcella dentata Ehrenberg.

Arcella dentata Ehrenberg: Ab. Ak. Wis. Berlin, 1830, 440; 1831, 90; 1871, 264.—Leidy: Proc. Ac. Nat. Sc. 1874, 14; 1876, 56.

Arcella stellaris Perty: Mittheil. Naturf. Gesells. Bern, 1849, 126.

Arcella Okeni Perty: Kennt. kleinst. Lebsf. 1852, 182, 186, taf. ix, fig. 4.

Arcella stellata Ehrenberg: Microgeologie, 1854, 192. Ab. Ak. Wis. 1871, 261, taf. iii, fig. 10.

A. Homoeochlamys dentata Ehrenberg: Abh. Ak. Wis. Berlin, 1871, 244.

A. Heterocosmia stellata Ehrenberg: ibid. 245.

A. Sticholepis stellaris Ehrenberg: ibid. 244.

This form is found in the same localities as *vulgaris* but occurs rarely. The shell is dentated. It is twice as high as it is broad. The dome is convexed and even or depressed at the summit, and broadly fluted at the sides. The base is centrally inverted, with the periphery somewhat everted. The mouth is entire and circular. The color is brown, in all shades, or there is no color. There are two nuclei and many contractile vacuoles. The diameter ranges from 130 to 185μ .

Genus CENTROPYXIS

The members of this genus all resemble those of *Arcella*, but they are armed with a variable number of spines. The shell is composed of chitinous material with the addition of sand grains, diatoms and other loose materials that the animal gathers. The shape is ovoid, with the mouth and fundus eccentric in opposite directions.

Centropyxis aculeata Stein.

Arcella aculeata Ehrenberg: Ab. Ak. Wis. Berlin, 1830, 40; 1841, 368, taf. iii, fig. 5. Infus. 1838, 133, taf. ix, fig. 6.

Arcella ecornis Ehrenberg: Ab. Ak. Wis. Berlin, 1841, 368, taf. i, fig. 9.

Diffugia aculeata Perty: Kennt. kleinst. Lebsf. 1852, 186.

Centropyxis aculeata Stein: Sitz. Böhm. Gesells. Wis. 1857.

Echinopyxis aculeata Claparede and Lachmann: Etud. Infus. 1859, 447.—Carter: An. Mag. Nat. Hist. xiii, 1864, 29, pl. i, fig. 8. Barnard: Proc. Am. Ass. Adv. Sci. xxiv, 1875, 241. Am. Quart. Mic. Journ. 1879, 83, pl. viii, fig. 3.

Arcella diadema Ehrenberg: Ab. Ak. Wis. Berlin, 1871, 258.

This very common form is usually found associated with *Arcella vulgaris*. There is considerable variation in the appearance some forms having from one to nine spines, while other forms have none. The shell is like that of *arcella* and is made of sand. The color is yellow or brown. Some forms are colorless. There is a single nucleus and two or more contractile vacuoles. The genus is not recognized by some investigators. Measurements of typical specimens are as follows: length of shell from 80 to 260μ ; height of shell from 36 to 80μ ; width of shell 72 to 220μ .

Genus DIFFLUGIA

The body is protected by a shell which is composed of foreign particles

such as fine quartz sand, diatoms and shells united by a chitinous connecting substance. The form is spherical to pear-shaped, and frequently there are spines at the posterior end. The mouth is usually terminal, and from it there may extend long, cylindrical pseudopodia, either simple or branched.

Diffugia corona Wallich.

Diffugia corona Wallich: An. Mag. Nat. Hist. xiii, 1864.—Leidy: Pr. Ac. Nat. Sc. 1874, 14, 79; 1877, 307.

Diffugia proteiformis subsp. *globularis*, var. *corona*. Wallich: *ibid*.

This is one of the most beautiful forms of *Diffugia*. The shell is smooth and has a spherical or spheroidal shape, and is composed of angular quartz sand. The fundus bears from three to twelve conical spines of the same composition as the rest of the shell. The mouth is terminal and circular, with its border multidentate or crenulate. The sarcoderm is colorless. There are many pseudopodia and they are large. The nucleus is single. The species occurs commonly on surface mud or among dirt adherent to submerged aquatic plants. It feeds on algae and on decaying vegetal matter. Length with spines 200 to 250 μ .

Diffugia pyriformis Perty.

Diffugia Leclerc: Mem. Mus. Hist. Nat. 1815, ii, 474, pl. 17.

Diffugia pyriformis Perty: Mittheil. Naturf. Gesells. Bern, 1848, 168.—Pritchard: Hist. Infus. 1861, pl. xvi, fig. 17.—Carter: An. Mag. Nat. Hist. xii, 1863, 249; xiii, 1864, 21, pl. i, fig. 1. Wallich: An. Mag. Nat. Hist. xiii, 1864, 240, pl. xvi, figs. 9, 10, 39, 40. Ehrenberg: Ab. Ak. Wis. Berlin, 1871, 264.—Leidy: Pr. Ac. Nat. Sc. 1874, 14, 79; 1877, 307.

Diffugia proteiformis, subsp. *mitriformis*, var. *pyriformis*. Wallich: An. Mag. Nat. Hist. xiii, 1864, 240.

Diffugia compressa. Carter: An. Mag. Nat. Hist. xiii, 1864, 22, pl. i, figs. 5, 6.

Diffugia entochloris. Leidy: Proc. Ac. Nat. Sc. 1874, 79; 1875, 307.

Diffugia vas. Leidy: Proc. Ac. Nat. Sc. 1874, 155; 1875, 307.

There is much variety in the size and shape of this species. Penard recognizes six varieties, the more common ones being, *compressa*, *nodosa*, *cornuta* and *vas*. The species has a very wide distribution and may be found in any pond or ditch as well as in rivers and lakes. The shell is pyriform or oval, the narrower pole being prolonged into a neck. The fundus is obtusely rounded or variably produced to form one, two or three conical processes. The mouth is inferior and terminal, and circular or slightly oval. The shell is usually composed of angular particles of quartz mixed with diatoms. Occasionally a shell will be found that is composed of a chitinous membrane with diatoms and sand. The endosarc is a bright green due to the presence of chlorophyll, or it may be colorless, or modified by the presence of food. The following variations in size have been recorded: length, from 60 to 580 μ ; width, from 40 to 240 μ ; width of mouth, from 60 to 120 μ .

Diffugia globulosa Dujardin.

Diffugia globulosa Dujardin: A. Sc. Nat. 1837, viii, 311, pl. ix, fig. 1 a and b.—Pritchard: Hist. Inf. 1861, 554, pl. xxi, fig. 10.

Diffugia proteiformis Ehrenberg: Infus. 1838, 131, taf. ix, fig. 1.—Micrographic Dictionary; 1860, 232, pl. xxiii, fig. 39.—Pritchard: Infus. 1861, 553.

Diffugia globularis Wallich: A. Mag. Nat. Hist. xiii, 1864, 241, pl. xvi, figs. 1, 2, 17, 27.

Diffugia acropodia Hertwig and Lesser: Arch. mik. Anat. 1874, x, Supl. 107, taf. ii, fig. 6.

The shell of this species varies considerably both as to shape and as to size. Many of the shells are spheroidal or oval with the oval pole truncated. The mouth is inferior, terminal, circular and usually truncates the shell. The shell is composed of quartz sand, of diatoms, or of a chitinoid membrane with sand and diatoms. The sarcode is colorless except when food particles add color. Shells made of sand range in size from 36μ long and 30μ broad to 260μ long and 185μ broad. The chitinoid shells showed a size of from 24 to 32μ .

Diffugia cratera Leidy.

Diffugia cratera Leidy: Proc. Ac. Nat. Sc. 1877, 307.

This is the smallest species of the genus and occurs but rarely. The shell is goblet-shaped, with an oval or spheroidal body and a wide, cylindrical neck. The fundus is obtuse. The mouth is terminal, large, circular and has a truncating neck, or a reflected rim. The animal is composed of a colorless, chitinoid membrane containing particles of sand and dirt. The size is between 56 and 66μ .

Genus CYPHODERIA

In this genus the shell is composed of chitinous material, retort-shaped, and curved backwards from the mouth. The body is differentiated into two divisions, the anterior containing the vacuole, and the posterior the nucleus. The pseudopodia are delicate and unbranched.

Cyphoderia ampulla Ehrenberg.

Diffugia ampulla Ehrenberg: Berichte Preuss. Ak. Wis. 1840, 199.

Cyphoderia margaritacea Schlumberger: A. Sc. Nat. 1845, iii, 255.—Fresenius: Abh. Senck. Naturf. Ges. 1856-58, ii, 225. taf. xii, figs. 28-36.—Stein: Sitzbr. Böhm. Akad. 1857.—Hertwig and Lesser: Arch. mik. Anat. 1874, x, Sup. 132.—Schulze: Arch. mik. Anat. 1875, xi, 106, taf. v, figs. 12020.

Euglypha curvata Perty: Kennt. kleinst. Lebsf. 1852, 187, pl. viii, 21.

Lagynis ballica Schulze: Organ. Polythal. 1854, 56, taf. i, fig. 7, 8.

Euglypha margaritacea Wallich: An. Mag. Nat. Hist. 1864, xiii, 240, 244, 245, pl. xvi, fig. 48.

Diffugia margaritacea Wallich: ibid.

Diffugia Seelandica Ehrenberg: Abh. Ak. Wis. 1869, taf. ii, fig. 23.

Diffugia adunca Ehrenberg: ibid. 1871, 248, taf. iii, fig. 8, 9.

Diffugia uncinata Ehrenberg: ibid. fig. 13.

Cyphoderia ampulla Leidy: Proc. Ac. Nat. Sc. 1878, 173.

The shell of this species has the shape of a retort, with a short, cylindrical neck curving downward and truncated by a circular mouth. The body of the shell is oval or oblong, with the longitudinal axis more or less inclined till it is nearly horizontal in the moving animal. The fundus is obtusely rounded, sometimes flattened and frequently more or less narrowed at the summit into nipple-like processes. The plates of the shell are round or oval and cemented together in diagonal rows, thus presenting a hexagonal appearance. The plates do not overlap. There are minute perforations between the plates giving to the whole plate a finely punctate appearance. The pseudopodia are few and very long. Length from 112 to 176μ . Width, 40 to 80μ .

Genus EUGLYPHA

This genus contains a number of distinct forms but the species appear to graduate into one another. They are distinguished by elegance and complexity of structure. The shell is chitinous and composed of overlapping plates. The shape is oblong-oval and circular in transverse section. The pseudopodia are delicate, simple or branched.

Euglypha alveolata Dujardin.

Euglypha alveolata Dujardin: Infusiores, 1841, 252, pl. ii, figs. 9, 10. Perty: Kennt. kleinst. Lebsf. 1852, 187.—Pritchard: Hist. Inf. 1861, 556, pl. xxi, fig. 11.—Carter: An. Mag. Nat. Hist. 1856, xviii, 221, pl. v, figs. 25-36.—Wallich: An. Mag. Nat. Hist. 1864, xiii, 240, pl. xvi, figs. 41-45.—Micrographic Dict. pl. 23, fig. 54.—Leidy: Pr. Ac. Nat. Sc. 1874, 225; 1877, 262, 321.

Euglypha tuberculata Dujardin: Infus. 1841, 251, pl. ii, fig. 7, 8.—Perty: Kennt. kleinst. Lebsf. 1852, 187.—Pritchard: Hist. Infus. 1861, 556.—Microg. Dict. pl. 23, fig. 53.

Diffugia areolata Ehrenberg: Abh. Ak. Wis. 1841, 413, taf. i, fig. 8.—Microgeologie: 1854, taf. xxxviii, fig. 2.—Zweite deutsche Nordpolarfahrt, 1874, taf. iii, fig. 23.

This is a very common Rhizopod and may be found everywhere in fresh water among algae or in the ooze at the bottom of ponds and lakes. The fundus is evenly dome-shaped. The mouth is circular and is bordered with from four to twelve angular, serrated points. The number of these points bears no relation to the size of the shell. In the larger forms, the shell is composed of regular plates of nearly uniform size. In the smaller forms, the areolar structure predominates. In the larger forms there may be from four to six thorn-like spikes projecting from the sides of the fundus. These are of variable length and are placed equidistantly. These spikes are invariably missing in the smaller forms, and even among larger forms that are found among algae and the roots of mosses. The sarcode is colorless or nearly so, except when an admixture of food makes it brown or green. It fills nearly the whole interior of the shell and invariably extends to the fundus, but it never adheres to the inner part of the shell by pseudopodial threads. The nucleus is large and spherical. There are two contractile vacuoles and many straight pseudopodia. The diameter varies between 25 and 150 μ . Large shells have from six to twelve teeth, and smaller ones have from four to eight. Shells of dead specimens occur everywhere. Large live forms are found in the sediment of springs, ponds, ditches, and lakes; small forms live about the roots of mosses in meadows, on the borders of ditches, on dripping rocks, and even on the mosses of brick pavements.

Euglypha ciliata Ehrenberg.

Diffugia ciliata Ehrenberg: Monatsb. Ak. Wis. Berlin, 1848, 379.—Leidy: Pr. Ac. Nat. Sc. 1878, 172.

Euglypha compressa Carter: An. Mag. Nat. Hist. 1864, xiii, 32, pl. i, fig. 13.—Leidy: Pr. Ac. Nat. Sc. 1874, 226.—Schulze: Archiv. mik. Anat. 1874, xi, 101, taf. v, fig. 3, 4.

Setigerella ciliata Ehrenberg: Abh. Ak. Wis. Berlin, 1871, 247.

Diffugia pilosa Ehrenberg: ibid. 256, taf. ii, fig. 28.

Diffugia strigosa Ehrenberg: ibid. 257, taf. ii, 31.

Euglypha strigosa Leidy: Pr. Ac. Nat. Sc. Phila. 1878, 172.

This form is common in wet sphagnum. It may be distinguished from alveolata by its fringe of bristle-like spines around the fundus and along the greater part of the lateral borders. The shell is compressed ovoid with the oral pole more or less tapering. The plates that compose the shell are elongated hexahedrons closely fitting at the margins and are arranged in longitudinal rows in alternating series. The mouth is bordered with from six to fourteen or more blunt, angular, crenulated teeth, composed of the lowest part of the shell. Length of the shell, 40 to 90 μ .

Genus TRINEMA

The animals of this genus are provided with a hyaline, pouch-like shell that has its long axis inclined or oblique. The mouth is subterminal. The structure of the shell appears to be homogeneous in the smaller forms, but in the larger forms there are circular plates arranged in alternating series.

Trinema enchelys Ehrenberg.

- Trinema* Dujardin: An. Sc. Nat. 1836, v, 198, 205, pl. ix, fig. Aa-Ad.
Diffugia Enchelys Ehrenberg: Infusth. 1838, 132, taf. ix, fig. iv.—Pritchard: Hist. Infus. 1861, 553, pl. xxi, fig. 19.
Trinema acinus Dujardin: Infusiores, 1841, 249, pl. iv, fig.—Perty: Kennt. kleinst. Lebsf. 1852, 187.—Fresenius: Abh. Senck. Naturf. Gesell. 1856-8, 223, taf. xii, fig. 25-27.—Claparede and Lachmann: Infus. et Rhizopodes, 1858-9, 455. Schulze: Arch. mik. Anat. 1875, 104, taf. v, fig. 9-11.
Euglypha pleurostoma Carter: An. Mag. Nat. Hist. 1857, xx, 35, pl. i, figs. 19 a-i.
Trinema anchelys Leidy: Pr. Ac. Nat. Sc. 1878, 172.

This is the common species, and the only one found by the writer. It has been described under many names. Ehrenberg, for example, describes it under fourteen synonyms, always, however, referring it to the genus *Arcella*. The animal may be found all the year round. It usually shows three pseudopodia, whence its generic name, three threads. These are long and fine. The aperture is circular and surrounded by a number of rows of very minute chitinous plates. There are two contractile vacuoles. Length from 40 to 100 μ .

Genus VAMPYRELLA

In this genus, the ectoplasm of the animals is usually hyaline, and red or brown. The form is amoeboid and subject to much change. The ray-like pseudopodia arise either on all sides or at one point. There is frequently a gelatinous covering through which the pseudopodia protrude.

Vampyrella lateritia Cienkowski.

- Amoeba lateritia* Fresenius: Abh. Senck. Naturf. Gesells. ii, 1856-8, 218, taf. x, figs. 13-19.—Cienkowski: Jahrb. wis. Bot. iii, 1863, 428.
Vampyrella Spirogyrae Cienkowski: Arch. mik. Anat. i, 1865, 218, taf. xiii, figs. 44-56.—Haeckel: Biol. Studien, 1870, 72.—Hertwig and Lesser: Arch. mik. Anat. x, 1874, Suppl. 61.—Archer: Quart. Jour. Mic. Sc. 1877, 347.

The granular protoplasm of the body is pervaded with coloring matter of shades of orange, red, yellow, brown and green. The color becomes, at times, so intense that the nucleus is obscured. There are two kinds of pseudopodial extensions,—pointed ones that start from a common center and sometimes fork but never anastomose—and broad, blunt, or lobate hyaline processes that

rapidly appear and disappear. Most of the pseudopodia are shorter than the diameter of the body. Leidy is the only author who speaks of acineta or pin-rays. He says that these have a minute pin or round head, and are continually pushed forth and withdrawn, whereas the ordinary rays are motionless. I have not observed this phenomenon. The diameter of the body averages 30μ .

Genus ACTINOPHRYS

The members of this genus are usually spherical with pseudopodia on all sides, the axial threads of which can be traced to the nucleus lying in a granular entosarc. The ectoplasm is colorless and is not sharply differentiated from the entoplasm. Colonial forms are not uncommon.

Actinophrys sol Ehrenberg.

Trichoda Sol Müller: Verm. Terrest. Fluv. 1773, 76. Anim. Infus. 1786, 164, tab. xxiii, figs. 13-15.—Schränk: Fauna Boica, iii, 2, 1803, 93.

Peritricha Sol Bory: Encycl. Meth. Vers. 1824.

Actinophrys sol Ehrenberg: Abh. Ak. Wis. Berlin, 1830, 42, 53, 61, 76, taf. ii, fig. 4.—Dujardin: Infusoires, 1841, 262, pl. iii, fig. 3. Stein: Infusionsthier. 1854, 151.—Pritchard: Hist. Infus. 1861, 559, pl. xxiii, figs. 28, 31, 32.—Grenacher: Verh. phys.med. Gesells. Würzb. i, 1868, 170, taf. iii.—Micrographic Dictionary, pl. 23, fig. 7b.

Actinophrys difformis Ehrenberg: Abh. Ak. Wis. Berlin, 1831, 102.

This very common species is found in all quiet waters associated with duck-meat, hornwort, bladderwort and all the filamentous algae. It is large, spherical, translucent and vesicular or foamy. The vesicles are numerous, crowded and uniform. A large nucleus occupies the central position in the body. This is often obscured from view and must invariably be brought out by chemical means. The contractile vacuole is single, large and active. The pseudopodia are numerous, flexible and retractile. They are from three to four times as long as the diameter of the body. The diameter of the body is about 100μ .

Genus ACTINOSPHAERIUM

The bodies of the animals in this genus are all large in size and spherical in outline. The protoplasm is granular and differentiated into an outer, highly vesiculated zone, and a denser interior region. There are many nuclei. The pseudopodia have thick bases and taper off with axial supports.

Actinosphaerium Eichornii Ehrenberg.

Der Stern Eichhorn: Beitr. Kennt. Wasserth. 1783, 15.

Actinophrys Eichhornii Ehrenberg: Berichte Preuss. Ak. Wis. 1840, 198.—Stein: Infusionsthier. 1854, 148, 151.—Claparede and Lachmann: Etud. Infus. i, 1858, 9, 450.—Haeckel: Radiolarien, 1862, 165. Cienkowski: Arch. mik. Anat. i, 1865, 227, 229.—Greeff: Arch. mikr. Anat. iii, 1867, 396.—Micrographic Dictionary, pl. 23, fig. 7a.—Schneider: Zeitsch. wis. Zool. xxi, 1871, 507.

Actinophrys sol. Kölliker: Zeitsch. wis. Zool. i, 1849, 198.

Actinosphaerium Eichornii Stein: Sitzungsber. Böhm. Gesells. Wis. 1857, 41. Greeff: Sitzungsber. nieder-rhein. Gesells. Bonn, 1871, 4.—Schulze: Arch. mik. Anat. x, 1874, 328, taf. xxii.—Hertwig and Lesser: Arch. mik. Anat. x, 1874, Suppl. 176, taf. v, fig. 1.—Leidy: Pr. Ac. Nat. Sc. 1874, 166.

This species is readily distinguished from actinophrys by a well-defined differentiation of the peripheral layer of vesicles from the interior mass. Stein, Carter and others say that there are over one hundred nuclei. I have found no forms in which this was the case. It is generally necessary to employ a reagent such as acetic acid to bring out the nucleus. The body of the animal is usually transparent and colorless. The smaller forms have a single layer of large vacuoles at the periphery. In larger or older individuals there may be two such peripheral layers or a uniform diameter. The species is a voracious feeder and devours many rotifers, ciliates, flagellates and diatoms. It seems to prefer the quiet waters where it appears nearly stationary. The diameter of the body is 150μ .

Genus RAPHIDIOPHRYS

The members of this genus appear either singly or in colonies. There is no sharp differentiation of the substance of the body. The skeleton is composed of irregular, loosely bound, straight or slightly bent silicious needles, tangentially arranged to the surface of the body or raised around the bases of the pseudopodia. Colonial forms have a common shell. Chlorophyll sometimes appears.

Raphidiophrys elegans Hertwig-Lesser.

Raphidiophrys elegans Hertwig and Lesser: Arch. mik. Anat. x, 1874, Suppl. 218, taf. iv, fig. 1.—Leidy: Pr. Ac. Nat. Sc. Phila. 1874, 167. Archer: Quart. Jour. Mic. Soc. 1876, 374, pl. xxii, fig. 19.

Sphaerastrum conglobatum Greeff: Arch. mik. Anat. xi, 1875, 29, taf. ii, fig. 24-26.

Specimens are found singly or in groups containing up to three dozen individuals. The body is bright green when it contains chlorophyll; when this is absent, the body is colorless. The form of the body is spherical but this can change readily. A distinct contractile vacuole with rhythmical action is wanting but a large vacuole is often seen near the periphery of the body. This vacuole enlarges and collapses, and is then replaced by a similar one in another position. The pseudopodia are very numerous, long and highly flexible. The species is common in springs and ponds and occurs among aquatic plants. The diameter of the body is from 32 to 40μ .

Genus CLATHRULINA

The animals of this genus resemble those of Actinophrys. There is no differentiation of the regions of the body. There are many contractile vacuoles and a central nucleus. The pseudopodia are numerous, frequently forked at the end and quite delicate. The skeleton is a silicious shell, nearly spherical, and contains many round or polygonal openings. The young shell is colorless, but later it becomes brown.

Clathrulina elegans Cienkowski.

Clathrulina elegans Cienkowski: Arch. mik. Anat. iii, 1867, taf. xviii.—Archer: Quart. Jour. Mic. Sc. viii, 1868, 71, 189; ix, 1869, pl. xvii, fig. 5; x, 1870, 117; xi, 1871, 322; xii, 1872, 195; xvii, 1877, 68, pl. xxii, figs. 23-25.—Greeff: Archiv. mik. Anat. v, 1869, 467, taf. xxvi, fig. 1-7.—Hertwig and Lesser: ibid. x, 1874, Suppl. 227, taf. v, fig. 4.—Leidy: Proc. Ac. Nat. Sc. Phila. 1874, 145, 166.

Phodospaera Haekeliana Archer: Quart. Jour. Mic. Sc. viii, 1868, 67.

This form is rarely found in an active condition. It is essentially single or solitary, though six or even more have been found together. The stem of attachment may be short, but stems have been found that were as long as the diameter of the capsule. The stem is highly flexible and has the same color as the capsule. The protoplasm does not quite fit the capsule. The diameter of the capsule varies between 3 and 4 μ . The length of the pellicle varies from 6 to 26 μ . The thickness of the pellicle is only about 2 or 3 μ .

BIBLIOGRAPHY

- BUETSCHLI, O. 1880-82—Protozoa. In Bronn's Klassen und Ordnungen des Thier-Reichs. Bd. 1.
- CALKINS, G. N. 1910—The Protozoa.
- CONN, H. W. 1905—The Protozoa of the Fresh Waters of Connecticut.
- DOFLEIN F. AND E. REICHENOW. 1927-29—Lehrbuch der Protozoenkunde. 5. ed.
- EDMONDSON, C. H. 1906—The Protozoa of Iowa. Proc. Davenport Ac. Sci.
- LEIDY, JOSEPH. 1879—Rhizopods of North America. Rep. U. S. Geol. Surv. Vol. XII.
- GRIFFITH, J. D. AND ARTHUR HENFREY. 1860—The Micrographic Dictionary. 2nd ed.
- SCHAEFFER, A. A. 1926—Taxonomy of the Amoebas. Papers Dept. Marine Biol. Carnegie Inst. Vol. XXIV.
- WARD, H. B. AND WHIPPLE, G. C. 1918—Fresh-Water Biology.

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DISTRIBUTION OF THE RED SQUIRREL IN INDIANA*

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The Red Squirrel, *Sciurus hudsonicus loquax* Bangs, or, as it is frequently known in Indiana, Piney, is rather generally distributed throughout the northern third of the state. It is common on the campus at the University of Notre Dame and occurs in some of the outlying portions of the city of South Bend. That it occurs as far south as the Ohio River, at least in small numbers or as errant visitors, is not so well known, and so far as ascertainable its distribution so far south in Indiana has not previously been published.

The accompanying map shows its distribution by counties in Indiana as far as I have been able to trace it. R, indicates published records; F, specimens in the Field Museum of Natural History; N, specimens in the University of Notre Dame; U, specimens in the United States National Museum; Z, specimens in the Museum of Comparative Zoology; 1, specimen in the North Madison High School; O, observations made by game wardens and county agricultural agents in response to a questionnaire sent out by the Indiana Department of Conservation. The evaluation of this questionnaire was difficult; for it was clear that several correspondents were unfamiliar with the animal. One or two in the southern counties were frank to say they did not know what squirrel was meant unless it was the large reddish Fox Squirrel.

Haymond, 1870, reported a specimen seen in Franklin County. Cox, 1893, reported it "very rare" for Randolph County. Walker, 1923, regarded the Red Squirrel as extending its range southward, reporting it at Sheridan, Hamilton County, although Hahn, 1909, had already reported it for Marion and Delaware Counties.

There is a specimen of the Red Squirrel in the Field Museum of Natural History, from Evansville, Vanderburg County. In January, 1934, Miss Edna Banta of the North Madison High School sent to me for examination and identification a skin taken by one of her students five miles west of North Madison, Jefferson County.** The species is so rare around there that none who saw it recognized or could identify it. Though I have travelled much over southern Indiana and talked about mammals with its natives, I had found so little evidence that the Red Squirrel occurred in the southernmost counties that I had been inclined to doubt the authenticity of the data on the label of

* Read at the Sixteenth Annual Meeting of the American Society of Mammalogists, May 8 to 12, 1934, New York.

** This specimen has been deposited in the United States National Museum.

the Evansville specimen. Miss Banta's specimen from near North Madison has removed all doubts.

My thanks are due to Miss Edna Banta for the opportunity of seeing her specimen and to the authorities of the museums mentioned above for the opportunity of examining the Indiana mammals in them.



Distribution of the Red Squirrel in Indiana. For explanation see text.

REFERENCES

- COX, ULYSSES O. 1893—A list of the birds of Randolph County, Ind., with some notes on the mammals of the same county. *Ornithol. and Ool.*, vol. 18, pp. 2-3.
- HAHN, WALTER LOUIS. 1909—The mammals of Indiana. 33rd Ann. Rep. Dep. Geol. Nat. Res. Indiana, p. 469.
- HAYMOND, RUFUS. [1870]—Mammals found at the present time in Franklin County, Indiana. 1st Ann. Rep. Geol. Surv. Indiana, 1869, pp. 203-208.
- WALKER, ERNEST P. 1923—The Red Squirrel extending its range in Indiana. *Journ. Mamm.*, vol. 4, pp. 127 and 128.

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